Boom-Bust Cycles: Facts and Explanation

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Abstract

There is a remarkable similarity across middle income countries in the patterns of macroeconomic variables around twin crises: there is a common boom-bust cycle. We characterize this cycle empirically. We find that prior to a twin currency and banking crisis the typical country experiences a real appreciation and a lending boom along which credit grows unusually fast. Puzzlingly, in the aftermath of a crisis there is typically a short-lived recession and a protracted credit crunch that persists long after aggregate growth has resumed. This pattern can be explained by the fact that the credit crunch mainly hits nontradables firms (N). In fact, for several years after the crisis N-production declines relative to the output of the tradable T-sector. These comovements indicate that 'currency mismatch' and asymmetric financing opportunities across sectors play important roles in middle income countries. We present a model where these elements play a key role and where the comovements alluded to above arise along the equilibrium path.

1. Introduction

During the eighties and nineties many middle income countries liberalized their financial markets. Frequently, the post-liberalization period has witnessed 'boom-bust cycles' that have been remarkably similar across countries. In this paper we characterize empirically the common patterns followed by several macroeconomic variables along these new boom-bust cycles, and we present a rationalization for such regularities.

We characterize the boom-bust cycle by means of an event study of the set of middle income countries where, in addititon to banks, the stock market is a viable source of finance. The cycle is centered around twin crises during which a real depreciation coincides with a banking crisis. We find that prior to a twin crisis the typical country experiences a real appreciation and a lending boom along which credit grows unusually fast. In the aftermath of a crisis there is typically a short-lived recession and a protracted credit crunch that persists long after aggregate growth has resumed. This can be explained by the fact that the credit crunch hits mainly small and nontradables firms (N). In fact, for several years after the crisis N-production declines relative to the output of the tradable T-sector, and the credit-to-deposits ratio falls.

In contrast to previous crises, large fiscal deficits have not taken center stage in the new boom-bust cycles. Furthermore, we find that investment is the component of GDP that experiences by far the largest swings over the cycle, and at the other extreme consumption varies the least.

In policy circles it is often argued that it might be optimal to impose 'speed limits' and stop lending booms, as they only reflect excessive risk taking and cronism. The evidence presented in this paper points towards a less malignant process. Although twin crises are typically preceded by lending booms, very few lending booms end in crisis. Like Gourinchas et. al. (2001), we find that most of the time lending booms end with 'soft landings' whereby credit gradually decelerates.

Do the comovements we have alluded to above exist only if we condition on the occurence of crisis? Or do they exists more generally over the post-liberalization period? We address this issue using panel regressions. We find that the boom-bust cycle in middle income countries is also reflected in strong comovements of credit, the real exchange rate and the ratio of nontradables-to-tradables output. Interestingly, these comovements have not been observed in counties with developed financial markets like the US. These comovements indicate that asymmetric

financing opportunities, balance sheet effects and currency mismatch play important roles in middle income countries. The fact that credit growth is positively correlated with the ratio of N-to-T output indicates that the N-sector is heavily dependent on bank credit, whereas the T-sector has other sources of external finance. The fact that credit growth coincides with a real appreciation, and that a credit crunch coincides with a drastic real depreciation, indicates that the N-sector is financed, to a large extent, with foreign currency denominated debt, and that it faces binding credit constraints.

Interestingly enough, we find that the patterns followed by key macroeconomic variables along the boom-bust cycle are not significantly different in countries with fixed exchange rates than in other countries. This suggests that the the mechanisms that generate the boom-bust cycle are not dependent on particular features of specific exchange rate regimes or monetary policy rules.

How can we explain a complete boom-bust cycle? It is well known that a currency mismatch can be induced by bailout guarantees, and that credit constraints can be generated by a credit market imperfection. The question arises as to whether one can construct a consistent framework where bailout guarantees do not neutralize the specific credit market imperfection. Furthermore, can the interaction between these two distortions generate the dynamic patterns that characterize the boom-bust cycle? In the second part of the paper we show how the model of Schneider and Tornell (2000) can help rationalize the boom-bust cycle.

The key point is that if bailout guarantees are *systemic,* then their *interaction* with contract enforceability problems gives rise to binding credit constraints and foreign currency denominated debt. These, in turn, generate balance sheet effects that: (a) deflate the value of debt and introduce a positive feedback between the real appreciation and the lending boom prior to a crisis; (b) cause the meltdown of the banking system and a real depreciation when a crisis hits, and (c) generate a credit crunch in the aftermath of crisis that hits the N-sector especially hard.

The paper is structured as follows. In Section 2 we characterize the boom-bust cycle. In Section 3 we present the panel regresion results. In Section 4 we present the model. In Section 5 we link the model to the stylized facts. Finally, in Section 6 we present the conclusions.

2. Stylized Facts

The experiences of Mexico around the Tequila crisis and of Thailand around the Asian crisis are prototypical examples of a boom-bust cycle. In this paper we will show that several features of such boom-bust cycles are typical of middle income countries that have experienced twin crises. Some of the stylized facts that constitute a boom-bust cycle are widely agreed upon, while others have only recently appeared in the literature or have only been associated with particular episodes.[1] To illustrate these facts we use an event study that includes a set of 39 middle income countries between 1980 and 1999. We start by describing the facts. Then in Subsection 2.1 we present event windows.

The boom-bust cycle

Many recent BoP crises have differed from their predecessors in that currency crises have coincided with banking crises, and the main villains have not been the traditional suspects such as fiscal deficits or current account deficits. This does not mean, however, that the 'new' crises have been totally delinked from fundamentals. Rather:

(i) *Twin crises are typically preceded by a real exchange rate appreciation and a lending boom along which bank credit grows unusually fast.*

During the lending boom banks fund themselves by borrowing abroad. Furthermore, they typically over-expose themselves to the N-sector and do not hedge the implied real exchange rate risk. Even when banks denominate loans in foreign currency, they face the risk that households and N-sector firms will not be able to repay in the event of a real depreciation. This is because in the event of a real depreciation the debt burden, in terms of domestic currency, will increase significantly.

When the crisis hits, a real depreciation takes place. Since many agents, especially those in nontradable sectors, had denominated their debts in foreign currency during the boom years, the real depreciation has dramatic 'balance sheet effects': many agents see the value of their debt mushroom, while their revenues remain flat. As a result, their ability to service their debts is reduced and their net worth plummets. There is, therefore, a sharp deterioration of the banks'

[1] See Demirguc-Kunt et. al. (2000), Eichengreen, et. al. (1995), Frankel and Rose (1996), Gourinchas et. al. (2001), Kaminski and Reinhart (1999), Krueger and Tornell (1999), Sachs, Tornell and Velasco, (1996), and Tornell (1999).

loan portfolio, and the banking system goes under.[2] To save the banking system bailouts are granted, frequently with IMF support.[3] Despite this support:

(ii) *In the aftermath of a crisis there is a recession, which is typically short-lived.*

Furthermore, a protracted credit crunch develops:

(iii) *In the aftermath of a crisis credit falls more sharply than GDP, and the gap widens over time even after economic growth has resumed.*

The puzzling coexistence of a protracted credit crunch and GDP growth several years after the crisis reflects the fact that aggregate GDP performance masks an asymmetric sectorial pattern:

(iv) *In the aftermath of crisis the tradable (T)-sector experiences an acceleration of growth after a mild recession, while the nontradable (N)-sector experiences a sharp fall and a sluggish recuperation. In contrast, prior to a crisis the N-sector grows faster than the T-sector.*

In the aftermath of crisis it seems as if the economy is doing well and deposit growth has resumed. However, banks do not resume lending. Perhaps because the meltdown that occurs during the crisis leads to poor capitalization of both the banks and the agents they lend to. The asymmetric sectorial response indicates that the agents mainly affected are households, as well as small and N-sector firms. Large and T-sector firms are not very dependent on bank credit, as they have access to other forms of external finance: trade credit, equity markets and bond markets. In contrast, in middle income countries N-sector agents are heavily dependent on bank credit, which is primarily determined by collateral values, not investment opportunities.[4] A related fact is that:

(v) *In the aftermath of crisis there is a sustained increase in the spread between lending and deposit rates.*

[2] An alternative explanation for the occurrence of banking crises is that there is a run on banks by depositors. There is no evidence, however, that during the last two decades the problems faced by banks have been initiated by runs (see Demirguc-Kunt et.al. (2000)).

[3] See Jeanne and Zettelmeyer (2001).

[4] Firm level evidence on the asymmteric financing opportunities of small and large as well as tradable and nontradable firms has been presented by Gelos and Werner (2002) for the case of Mexico.

Facts (iii)-(v) suggest the following transmission mechanism. When the crisis hits, both the interest rate and the spread jump. While large and T-firms are able to shift away from bank credit to other forms of external finance, small and N-firms are not. This results in a deterioration of the banks' credit pool, which in turn feeds back into a higher spread. The outcome is a protracted credit crunch, during which increases in the stock of outstanding bank credit reflect mostly 'evergreening' rather than fresh loans. Along this path the T-sector may initially suffer a mild and short-lived decline, after which it will grow rapidly. The upshot is that the N/T ratio will decline even though aggregate GDP increases.

In order to construct a theoretical explanation it is important to determine which components of GDP drive the typical boom-bust cycle. Is a twin crisis typically preceded by a consumption boom or an investment boom? Is there a big fiscal expansion and/or a current account deterioration before a crisis? In answer to these questions, we find that

(vi) *Investment is the component of GDP that exhibits by far the largest (and statistically significant) deviations from tranquil times, while consumption deviations are very mild and insignificant.*

To discriminate among models it is also important to know whether crises are self-fulfilling or are generated by a large exogenous shock. It is difficult to determine whether a large exogenous shock was present. We looked to the usual suspects and we find that:

(vii) There is no significant deterioration in either the terms of trade or the US interest rate in the year prior to the crisis.

Stylized facts (i)-(vii) complete our description of a boom-bust cycle. The question we address next is whether the properties of the boom-bust cycle vary across exchange rate regimes. In particular, is it true that only counties with fixed exchange rates experience boom-bust cycles? We find that

(viii) The boom-bust cycle under fixed exchange rates is not significantly different from the cycle under non-fixed regimes.

It is interesting to note that during the 1980s and 1990s the US did not experience the boom-bust cycle we have described. To make this clear Figure 9 depicts the evolution of key macro variables for Mexico and US. It is evident that the US

has experienced neither pronounced asymmetrical sectorial patterns nor dramatic swings in the evolution of credit and the real exchange rate. In contrast, the evolution of the economy in Mexico, for example, exhibits a dramatic boom-bust cycle.

Lending Booms

Next, we shift our attention from cycles to lending booms in order to emphasize that although almost every crisis has been preceded by a lending boom, not all lending booms end in crisis. To the contrary:[5]

(ix) *The typical lending boom does not end in crisis, but with a 'soft landing.'*

Soft landings suggest that not all lending booms reflect either excessive risk taking or cronism. Instead, they may be a symptom of a less malignant process. The fact that bank credit is the only source of external funds for a big set of agents in the economy implies that many agents are not able to exploit all investment opportunities. Instead, their investment is mainly determined by collateral values. In such a world lending booms are episodes during which borrowing constraints are eased.

A related fact is that even during lending booms crises are rare events. In our sample the probability that there is a crisis in a given country-year, conditional on a lending boom, is around 6%.

The question then arises as to what determines the timing of a lending boom. Perhaps these episodes follow structural reforms that improve the long run prospects of a country. To address this issue we consider the financial liberalization date as a proxy for the timing of such reforms. We find that in our set of countries:

(x) *A financial liberalization is typically followed by a lending boom.*

The previous two facts suggest that financial liberalization, and the reforms that typically go with it, make the future look brighter than the present. In anticipation, credit constrained agents try to expand capacity to satisfy that increased future demand for their products and services. The implied deficits are frequently financed by foreign capital inflows from abroad, which are channeled to domestic agents through the domestic banking system. Why aren't these flows taking place through the equity or bond markets? Because there are severe enforceability problems, and domestic banks have specific lending skills and collection abilities.

[5] This fact has been established by Gourinchas et. al. (2001).

Domestic banks, in turn, must issue short term debt in order to be able to get funds (see Diamond and Rajan (2000)). Furthermore, since systemic bailout guarantees are typically present there are incentives for currency mismatch to arise (see Schneider and Tornell (2000)).

Certainly, very large firms and those in the tradables sector can access world capital markets. However, this is not true for the majority of firms operating in the economy.

2.1. Event Study

The figures below show the average behavior, across a set of countries, of several macroeconomic variables around twin currency and banking crises. We consider practically all countries with per-capita incomes between \$1,000 and \$18,000, plus Sweden and Finland, who have experienced often studied twin crises. The period we consider is 1980-1999.[6] Index t in the figures refers to the year during which a twin crisis takes place (we say that there is a crisis at t if both a currency and a banking crises occur during year t, or if one occurs at t and the other at $t+1$). The graphs below are the visual representations of the point estimates and standard errors from regressions in which the respective variable in the graph is the dependent variable, regressed on time dummies preceding and following a crisis. The panel data estimations account for differences in the mean, by allowing for fixed effects, as well as for differences in the variance, by using a GLS estimator. The heavy line represents the average deviation relative to tranquil times. The thin lines represent the 95% confidence interval. The point estimates corresponding to the event windows in the text are reported in the appendix.[7]

Figure 1 shows that during the year prior to the crisis the typical economy in our set of countries experiences a 5% appreciation relative to tranquil times, and that this appreciation is statistically significant.

[Insert Figure 1]

Figure 2 illustrates the existence of a lending boom in several different ways. Panels (a)-(b) refer to the stock of real credit: during the two years prior to the

[6] See the appendix for the list of 39 countries we consider.

[7] The patterns in the event windows we present below are basically the same as the patterns that would arise if we were to consider a subset of countries that have experienced well known crises: Argentina, Brazil, Chile, Indonesia, Finland, Korea, Malaysia, Mexico, Phillippines, Sweden and Thailand. The event windows for this subset of countries is presented in the appendix, Figure B.

crisis its growth rate is significantly higher than during tranquil times (around 3%), and its level is significantly above the Hodrik-Prescott trend.[8] Panels (c)-(d) show that the same behavior is exhibited by the credit-to-GDP and the credit-to-deposits ratios.

When twin crises hit there is an average real depreciation of around 16% relative to tranquil times (which is statistically significant). Real credit growth declines back to the growth rates that are observed during tranquil times, after being above the tranquil time mean in $t-1$ and $t-2$. The lending boom thus comes to an end in the year of the crisis.[9]

Let us consider now what happens in the aftermath of crisis. As we can see in Figure 3, both during and the year after the crisis the growth rate of GDP is approximately 5% below its level during tranquil times (panel a). The growth rate starts recovering at $t+2$ and it attains its tranquil time mean growth rate by $t+3$. Adding the average GDP growth during tranquil times of 2.8%, it follows that the recession lasts only for 2 years (t and t+1). Looking at deviations from an HP-trend tells the same story (panel b).

[Insert Figures 2, 3 and 4]

Figure 2 shows that in the year after the onset of the crisis credit falls more severely than aggregate GDP. The puzzling fact is that the 'credit crunch' becomes more severe through time: the credit-to-deposits and credit-to-GDP ratios decline monotonically. Even by $t+3$ there is no sign of a reversal of the credit crunch. In fact, at $t+3$ the credit-to-deposits ratio becomes significantly lower than its tranquil time's level! Put another away, from the onset of the crisis until $t+3$ GDP experiences a cumulative growth rate loss of 13%, while the cumulative loss in real credit is about 30%. It is interesting, though, that not all of the financial deepening gains made during the boom are lost during the bust, as suggested by the behavior of the credit-to-GDP ratio.

Figure 4 looks at the ratio of nontradables-to-tradables production. As we can see, prior to the crisis the N/T ratio is significantly above its tranquil times level,

[8] The deviation of the HP-trend is not exactly equal to zero on average for all countries. Therefore, to be more precise, the graph shows the "deviation from the average deviation from the HP-Trend during tranquil times". However the later is close to zero in most countries.

[9] Two comments are in order. While the growth rates are easily comparable across countries, the levels are not due to different long term trends, structural breaks, etc. (unless they represent the level of a ratio, such as credit/deposits or credit/GDP). The HP-trend is therefore a trend corrected proxy for the levels. Second, the fact that the HP deviations are positive at t may reflect the 'evergreening effect.'

while in the aftermath of the crisis the N/T ratio follows a declining path, and it becomes significantly lower than its tranquil times level by t+3. Interestingly, this path is quite similar to that followed by the credit-to-deposits ratio in Figure 2.

We proxy N-sector and T-sector production with data for construction, manufactures and services. Since the price of N-goods tracks international prices less closely than that of T-goods, for each country we classify as N(T) sector[s] in which the sectorial real exchange rate varies the most(the least). Construction is never classified as a T-sector, while for services and manufacturing the choice between N and T varies across countries.[10]

Figure 5 exhibits the behavior of the spread for a set of 11 countries for which we have good data.[11] The figure shows that when the crisis hits, there is an upward jump in the spread between lending and deposits rates. Moreover, the spread remains significantly higher 3 years after the onset of the crisis.

[Insert Figure 5, 6 and 7]

Figure 6 looks at the behavior of GDP's components relative to tranquil times. Investment exhibits a significantly higher growth rate of 2-3% during the three years prior to a crisis and a lower growth rate of 1-2% during $t+1$, $t+2$ and $t+3$. For consumption, there is neither an increase before the crisis, nor a decrease after the crisis. Government expenditure is not significantly different, except for the year of the crisis and in $t+2$, when it is significantly higher. Lastly, exports are not significantly different from tranquil times in the build up, but clearly are above in the aftermath of a crisis. This pattern is consistent with our previous observation that the T-sector suffers less after the crisis than the N-sector.

Figure 7 addresses the question of whether crises are caused by 'big exogenous shocks.' It shows that both at t and at $t-1$ the terms of trade and the US interest rate are not significantly different than their tranquil times means. Of course, there might be other exogenous shocks that rock the boat. The point is that neither the terms of trade nor the US interest rate can be invoked to explain the occurrence of crises. Furthermore, to the best of our knowledge, no one has

[10] The N-sector is proxied by construction in 17 countries, by services in 22 countries and by manufacturing in 5 countries. The T-sector is manufacturing in 39 cases and services in 5 cases. We consider that the criterion we use captures better the concept we want to measure than the exports-to-production ratio. In any case the results are robust to changes in the definition of non-tradables, as for most countries both indicators coincide.

[11] Argentina, Brazil, Chile, Indonesia, Finland, Korea, Malaysia, Mexico, Phillippines, Sweden and Thailand.

yet identified any exogenous shock as the cause of well know crises, such as the Tequila or Asian crisis.

Figure 8 presents the evolution of key variables for Mexico and the US. Here we choose the period 1989 to 1999 for Mexico and 1986 to 1996 for the United States, as the early 1990s are often argued to have been characterized by a credit crunch in the US. We find that the behavior of the main variables around the 1994 crisis in Mexico and the 1991 recession in the US are fundamentally different. In particular, asymmetric sectorial patterns are evident in Mexico, while not in the US.[12] A common feature is that real GDP recovered quickly in both countries.

[Insert Figure 8]

In order to investigate whether the boom-bust cycles are dependent on whether the exchange rate regime is fixed, we break our set of countries into two groups: fixed and non-fixed. There are two ways to make this classification: de jure and de facto. Figure 9 shows the event windows corresponding to the de facto classification by Levy-Yeyati and Sturzenegger (2000).[13] Although there are differences in the details, all of the variables display patterns that are broadly similar between the two groups of countries, both before and after the crisis.

[Insert Figure 9]

To see whether lending booms typically end with a 'soft landing,' not in a crash, we cannot center the analysis around a crisis as we have done so far. Instead, we need to consider all country/years and define what we mean by the beginning of a lending boom. There are several ways in which this can be done. We will say that a lending boom starts at t if real credit grows by more than 10% per year during t and $t+1$. Figure 10 depicts the typical lending boom. Panel (a) shows that if a boom starts at t, credit growth will be significantly above the HP trend for 6 years. Furthermore, after an initial buildup phase, credit growth starts to gradually decelerate at $t+4$ and it lands softly to its trend by $t+6$. Panel (b) shows that the same pattern arises if we look at real credit growth rates. In this case the duration of the boom is somewhat shorter but also fades out gradually.

Another way of investigating whether there is a soft landing is to look at conditional probabilities of crises and booms as we do in Table 1. Take the case in

[12] In these graphs, tradable output in both countries is proxied by manufacturing and non-tradable output is proxied by construction.

[13] The event windows for the de jure clasification, based on Berger et.al. (2000) are reported in Figure A in the appendix. The graphs look qualitatively the same as those in Figure 9. In fact, for most countries in our sample de jure and de facto indicators coincide. A notable exception is Mexico 1994, which was fixed de facto, but not fixed de jure.

which a lending boom is a pair of country-years in which credit grows by 20% or more. Table 1 shows that crises tend to be preceded by booms: $p(lb|cr) = 91\%$. However, the converse is not true: if a boom starts at t, the probability of a crisis in either $t+2$ or $t+3$ is approximately $p(cr|lb) = 6\%$. This is a rather small number, although relatively much bigger than the probability of a crisis in tranquil times, which is 3.9%.

To see whether financial liberalization is typically followed by a lending boom we use the liberalization dates of Bekaert et. al. (2001), and follow a similar procedure as in Figure 10. Panel (a) in Figure 11 shows that the growth rate of credit is significantly above its tranquil time mean for 5 years after liberalization. Panel (b) shows that starting in the third year after liberalization the deviation of real credit from its HP trend becomes significantly positive.[14]

[Insert Figures 10, 11 and Table 1]

3. Co-movements

The event windows clearly show that the behaviour of key macro variables around twin crises is significantly different from during tranquil times. The behaviour of these variables around twin crises characterize the boom-bust cycle. Here we ask whether these patterns have been reflected in statistically significant co-movements among some macro variables during the last two decades in middle income countries. For instance, does credit growth commove with the real exchange rate and the N/T ratio? Does it commove with investment and GDP? We address this question by regressing real credit growth on several variables. The panel data estimation is implemented allowing for fixed effects and a GLS estimator.[15] Again, we have our set of 39 countries in the cross section dimension and the period 1980-1999 in the time series dimension.

The first regression in Table 2 shows that an increase in credit is associated with (i) a real appreciation and (ii) an increase in the ratio of nontradables-to-tradables output. It is remarkable that these partial correlations are higly significant across different specifications. Correlation (i) indicates that there exist 'balance sheet

[14] Since financial liberalization constitutes a structural break in the series, the interpretation of tranquil times is less clear. However for our purposes the dynamic pattern is relevant and the increase of credit after liberalization is clear regardless of the mean credit growth that exisits in the years not covered by the dummies in the regression.

[15] All variables are in first differences in oder to avoid the issues associated with non-stationarity.

effects': in the presence of a currency mismatch, a real appreciation deflates the debt burden. This increases cash flow and the ability to borrow. Correlation (ii) indicates that the N-sector is more 'credit-constrained' than the T-sector.

We also find that investment growth is statistically significant, but GDP growth is not. Interestingly, GDP enters the regression with a negative sign. This reflects the puzzle we have noted earlier: in the aftermath of crisis a credit crunch coexists with a recovery of aggregate GDP. To investigate this further we define the interaction term $GDP * Dummy$, where the dummy is equal to one in the period of the crisis, and in the following three periods, while it is equal to zero otherwise. Regression 4 shows that $GDP * Dummy$ enters with a negative sign and is statistically significant, while GDP enters with a positive sign, but remains insignificant. As the sum of the two coefficients is clearly negative, credit and GDP are negatively correlated in the aftermath of crisis, while there exists no statistical relationship that adds to the information provided by investment, the real exchange rate and N/T, otherwise. Regression 5 shows that if GDP and $GDP * Dummy$ are included without investment, the coefficient on GDP is positive and the one on the interaction dummy is negative. Both are significant.

It is likely that the some of the explanatory variables are endogenous. In order to test for the robustness against the simultaneity problem, we estimated the model with two stage least squares, rather than OLS, using lagged variables as instruments. This yielded qualitatively similar results. The partial correlations reported in figure 2, of course, cannot be interpreted as causal relations. However the fact that a simple regression reveals the co-movements we have alluded to above is remarkable.

[Insert Table 2]

4. Conceptual Framework

To explain some of the stylized facts that we have described 'third generation' crises models have looked to financial market imperfections as key 'fundamentals'. The models are typically based on *one of two* distortions: either "bad policy", in the form of bailout guarantees, or "bad markets", in the form asymmetric information, or the imperfect enforceability of contracts in financial markets.[16]

[16] See for instance, Aghion, Bacchetta and Banerjee (2000), Burnside, Eichenbaum and Rebelo (2000), Caballero and Krishnamurthy (1999), Calvo (1998), Corsetti, Pesenti and Roubini (1999), Krugman (1999) and Mckinnon and Pill (1998).

On the one hand, bailout guarantees lead agents to undertake excessive risk. This can explain dollar denominated debt and overinvestment. On the other hand, financial frictions lead lenders to be very conservative and give rise to credit constraints. This can explain credit crunches and underinvestment. In general, these distortions neutralize each other: when guarantees are present lenders might not care whether a borrower will repay. Thus, credit constraints will not arise in equilibrium.

Schneider and Tornell (2000), henceforth ST, consider an economy where these two distortions do not neutralize each other and show how their *interaction* generates several features of the boom cycle. In this section we present some elements of ST's model that will be useful to rationalize the dynamic patters observed along boom cycles.

There are two goods in the economy: a tradable (T) and a nontradable (N). We will denote their relative price (i.e., the inverse of the real exchange rate) by $p_t = \frac{p_{N,t}}{p_{T,t}}$.

The model has two distinctive features. First, the only source of uncertainty is endogenous real exchange rate risk: in equilibrium p_{t+1} might equal $\overline{p}_{t+1}$ with probability α or $\underline{p}_{t+1}$ with probability $1-\alpha$. This captures the fact that crises are typically not preceded by large exogenous shocks. The second feature is that only N-sector agents may be subject to credit constraints. This captures the fact that in middle income countries T-sector firms have easy access to external finance because they can either pledge export receivables as collateral, or can get guarantees from closely linked firms. In contrast, collateralized bank credit is practically the only source of external finance for small and N-sector firms.

The N-Sector

In order to model the debt-denomination decision N-sector agents are allowed to issue either 'risky debt' or 'safe debt'. Risky debt is denominated in T goods (foreign currency) on an unhedged basis, while safe debt is denominated in N goods. To make matters concrete it is assumed that there is a continuum of firms run by overlapping generations of managers. The representative firm begins period t with internal funds w_t, and raises an amount $b_t + b_t^n$ by issuing one-period bonds that pay off in T-goods and N-goods, respectively. The promised repayment is

$$L_{t+1} + p_{t+1}L_{t+1}^n = (1+\rho_t)b_t + p_{t+1}(1+\rho_t^n)b_t^n \tag{4.1}$$

A manager can use his investable funds to buy a delfault-free international bond (s_t) with a return $1+r$, or he can buy an amount I_t of N-goods to produce N-goods

according to a linear production technology.

$$q_{t+1} = \theta\, I_t \tag{4.2}$$

The existence of default-free bond rules out the adoption of negative NPV investment projects. Since b_t and b_t^n are measured in T-goods, the budget constraint is

$$p_t I_t + s_t = w_t + b_t + b_t^n \tag{4.3}$$

At time $t+1$ a firm's cash flow in terms of T-goods is

$$\hat{\pi}(p_{t+1}) := p_{t+1}\theta I_t + (1+r)s_t - L_{t+1} - p_{t+1}L_{t+1}^n \tag{4.4}$$

If the firm is solvent ($\hat{\pi}(p_{t+1}) > 0$), the manager pays out a fraction c of profits as dividends to himself and passes on the remainder to the next manager. If a firm is insolvent (i.e., $\hat{\pi}(p_{t+1}) < 0$), all returns are dissipated in the bankruptcy procedure. In this case the new cohort of managers receives an 'aid payment' e to jump start their firms. Thus, internal funds evolve according to $w_0 = e_0$, and for $t \geq 1$:

$$w_t = \begin{cases} [1-c]\hat{\pi}(p_t) & \text{if } \hat{\pi}(p_t) > 0 \\ e & \text{otherwise} \end{cases} \tag{4.5}$$

We assume that in period 0 there is both a cohort of initial incumbent managers who have an amount q_0 of nontradables to sell and a cohort of new managers who have an endowment e_0 in terms of tradables.

Distortions

N-sector financing is subject to two distortions: contract enforceability problems and bailout guarantees. It is well known that in an economy in which only enforceability problems are present, like in standard financial accelerator models, the amount of credit available to a firm is determined by its internal funds (w_t).[17]

Let us introduce bailout guarantees. If all debt were covered by 'unconditional' guarantees (i.e., if bailouts were granted whenever there is an individual default), then enforceability problems would not generate credit constraints because lenders would be bailed out in all states of the world. Thus, in order for credit constraints to arise in equilibrium some portion of debt must be covered only by 'systemic' bailout guarantees. That is, bailouts are granted only if a critical mass of agents

[17] See Bernanke et. al. (2000).

defaults. For concreteness we assume that a bailout occurs if and only if more than 50% of firms are insolvent ($\hat{\pi}(p_{t+1}) < 0$) in a given period. During a *bailout* an international organization pays lenders a fraction $F \in \{0, 1\}$ of the outstanding debts of all defaulting managers, regardless of debt-denomination (N- or T-goods).

The T-sector

The N-sector will take center stage in the model. For our purposes it is sufficient to think of the T-sector as a group of agents that demands N-goods (D_t) and produces tradable goods (q_t^{tr}). What is important for the argument is that the demand function for N-goods be downward-sloping and that it be expected to increase at some point in the future. Thus, we assume that $D_t(p_t) = \frac{d_t}{p_t}$. Hence, the market clearing condition for non-tradables is

$$\frac{d_t}{p_t} + I_t = q_t^n. \tag{4.6}$$

where I_t is the investment demand of the N-sector. The supply of T-goods q_t^{tr} will play no role in the model. In fact q_t^{tr} will only appear in Section 5 when we refer to the gross domestic product: $GDP_t = q_t^{tr} + p_t q_t^{nt}$. In order to link the model to the facts in Section 5, it will not be necessary that q_t^{tr} be decreasing in p_t. We thus simply assume that q_t^{tr} follows a linear trend: $q_t^{tr} = \varepsilon q_{t-1}^{tr}$, where ε is an arbitrary constant.

4.1. Currency Mismatch and Endogenous Risk

The first main result of ST is that the *interaction* of systemic bailout guarantees and enforceability problems can generate endogenous real exchange rate risk. This is because there is a self-reinforcing mechanism at work. On the one hand, if there is sufficient real exchange rate risk: (a) credit constraints arise and (b) it is individually optimal for an N-sector agent to issue risky T-debt (i.e., borrow in foreign currency on a short-term and unhedged basis). On the other hand, if *many* N-sector agents gamble by denominating their debt in T goods, exchange rate risk might be endogenously created, as the economy becomes vulnerable to *self-fulfilling meltdowns* of the banking system. If the amount of T denominated debt is high, a real depreciation can severely squeeze cash flow, or even bankrupt banks altogether. Since they face binding borrowing constraints, they then have to curtail lending to the N-sector. Weak investment demand from the N-sector for its own products in turn validates the real depreciation. The systemic credit

risk created by the banking system thus induces endogenous exchange rate risk.

Risky Debt Denomination

To see how real exchange rate variability induces risky debt assume for a moment that the equilibrium real exchange rate process is such that $\bar{p}_{t+1}$ will be high enough so as to make production of N goods a positive NPV activity, while $\underline{p}_{t+1}$ will be low enough so as to bankrupt firms with T-debt **on** their books:

$$\hat{\pi}(\bar{p}_{t+1}) > [1+r]w_t, \qquad \hat{\pi}(\underline{p}_{t+1}) < 0 \tag{4.7}$$

ST show that if (4.7) holds and crises are rare events, then credit constraints arise in equilibrium: lenders constrain credit to ensure that borrowers will repay in the no-crisis state.

Since in the no-crisis state debt is repaid in full, while in the crisis state there is bankruptcy and each lender receives a fraction F of what he was promised, the interest rates on T-debt and N-debt (ρ_t and ρ_t^n, respectively) are given by:

$$\begin{aligned} 1+\rho_t &= \frac{1+r}{\alpha+(1-\alpha)F} \\ 1+\rho_t^n &= \frac{1+r}{\alpha\bar{p}_{t+1}+(1-\alpha)\underline{p}_{t+1}F}, \end{aligned} \tag{4.8}$$

where r is the world interest rate and $1-\alpha$ is the probability of crisis. Since $\bar{p}_{t+1} > \underline{p}_{t+1}$, we can see that T-debt is 'cheaper' than N-debt for all positive bailout rates ($F > 0$): the interest rate as well as the expected repayments per unit debt are lower for T-debt than for N-debt.[18]

Another advantage of T-debt is that the firm can borrow more:

$$\bar{b}_t^n = H^s w_t, \qquad \bar{b}_t = H^r w_t, \qquad 0 < H^s < H^r \tag{4.9}$$

This is because since shifting from N to T- debt reduces the expected debt burden, lenders are willing to lend more at each level of internal funds.

A disadvantage of T-debt is that it might lead to insolvency. Since there are bankruptcy costs, when there are no bailout guarantees, it is optimal for an

[18] We can see directly from (4.8) that $\rho_t < \rho_t^n$. Since debt is repaid with probability α, expected repayment per unit debt is $\frac{\alpha[1+r]}{\alpha+(1-\alpha)F}$ for T-debt and $\frac{\alpha[1+r]}{\alpha+(1-\alpha)F\frac{\underline{p}}{\bar{p}}}$ for N-debt.

agent to denominate all debt in N-goods. However, if crises are rare events (α is large) and bailouts are generous (F is large), then it is individually optimal to denominate debt in T goods.

Since (4.7) holds, the production of N-goods is a positive NPV activity. Thus, managers will invest as much as possible: $p_t I_t$ will equal either $w_t + \bar{b}_t^n$ or $w_t + \bar{b}_t$. Hence, we obtain the well known result that investment of a credit constrained firm depends not only on the rate of return, but also on cash flow (with our linear structure, the rate of return enters only through the positive NPV condition):

$$I_t = m_t \frac{w_t}{p_t}, \qquad m_t = \begin{cases} m^s & \text{if } b_t = 0 \\ m^r & \text{if } b_t^n = 0 \end{cases} \tag{4.10}$$

where $m_t = 1 + H_t$ denotes the investment multiplier.

In order to determine the equilibrium plans recall that bailouts are granted only during a 'systemic' crisis. Thus, as long as nobody expects a bailout, everybody hedges, and a crisis – and hence a bailout – cannot occur. In other words, a safe symmetric equilibrium always exists. This is independent of whether the real exchange rate is variable or not. However, in a world with bailout guarantees there is also a risky symmetric equilibrium. Indeed, suppose that a manager believes that all other managers will undertake risky plans. He will conclude that a bailout will occur in the bad state. Thus, he will take on real exchange rate risk and go bankrupt in the bad state, along with all other managers, triggering a bailout.

Real Exchange Rate Risk

Next we reverse the question and ask when is it that a risky debt structure can generate real exchange rate risk. We assume that (4.7) holds, that incumbent managers enter the current period with a supply of nontradables q_t, no bond holdings ($s = 0$) and a debt burden $L_t + p_t L_t^n$. The new cohort chooses its plans taking as given the value of the internal funds they get from incumbents and future prices.

As long as incumbents are solvent, internal funds are $w_t = (1-c)\hat{\pi}_t$, where $\hat{\pi}_t = p_t \theta I_t - L_t - p_t L_t^n$. In contrast, if the bad state is realized and firms become insolvent, the new cohort starts out with an endowment e of T goods. Investment expenditure is thus $p_t I_t = \eta_t [p_t q_t - L_t - p_t L_t^n]$ if $p_t q_t \geq L_t + p_t L_t^n$, or $p_t I_t = m_t e$ otherwise (the *cash flow multiplier* η_t is defined by $\eta_t := (1-c) m_t$).

The equilibrium real exchange rate equalizes total demand for and the supply

of nontradables. Since the T-sector's demand for non-tradables is equal to d_t/p_t,

$$q_t = \begin{cases} \frac{d_t}{p_t} + \eta_t \left[q_t - \frac{L_t}{p_t} - L_t^n \right] & \text{if } p_t q_t \geq L_t + p_t L_t^n \\ \frac{d_t + m_t e}{p_t} & \text{otherwise} \end{cases} \tag{4.11}$$

Since supply is predetermined ($q_t = \theta I_{t-1}$), the key to having multiple equilibria is a backward bending aggregate demand curve, as in Graph 1. This is impossible if there is only N-debt ($L_t = 0$). However, multiple equilibria are possible if there is T-debt (and $L_t^n = 0$). In this case price movements affect revenues, but keep the debt burden unchanged. For prices below the cutoff price $p_t^c = \frac{L_t}{q_t}$, all N-firms go bankrupt, and total demand is downward sloping. In contrast, for prices above p_t^c, investment demand is *increasing* in price. This makes total demand 'bend backward' and cross the supply schedule twice (as in Graph 1) if and only if

$$L_t > d_t + m_t e \qquad \text{and} \qquad \eta_t > 1 \tag{4.12}$$

A 'strong balance sheet effect' ($\eta_t > 1$) means that an increase in N-sector's cash flow induces a more than proportional increase in the N-sector's expenditure on its own goods. As we shall see, $\eta_t > 1$ is not only necessary for self-fulfilling crises, but it is also key for the existence of lending booms.

[Insert Graph 1]

With identical fundamentals, in terms of supply and debt, the market may clear in one of two equilibria. In a 'solvent' equilibrium (point B in Graph 1), the price is high, inflating away enough of firms' debt (measured in nontradables) to allow them to bid away a large share of output from the T-sector. In contrast, in the 'crisis' equilibrium of point A, the price is low to allow the T-sector and bankrupt N-firms with little internal funds to absorb the supply of nontradables. Which of these two points is reached depends on expectations. Fundamentals determine only whether the environment is fragile enough to allow two equilibria.

4.2. Equilibrium Dynamics

We have seen that if the price process satisfies (4.7), then agents choose a risky debt denomination and there are multiple possible values for the real exchange rate. In this subsection we will exhibit an equilibrium along which (4.7) holds and a crisis can occur with probability $1 - \alpha$ during any period $t < T$.

First of all, in order to have a lending boom it is necessary that N firms will be able to repay their debts at time T in case a crisis, and hence a bailout, does

not take place. This requires that the N-sector's future looks sufficiently bright relative to the present. We capture this by assuming that at time T there will be an outward shift in the demand for N-goods by the T-sector (d_t/p_t), and this is known by all agents as of time 0 :

$$d_t = \begin{cases} d & \text{if } t < T \\ \hat{d} > d & \text{if } t = T \end{cases} \tag{4.13}$$

This future shift in d_t can represent a T-sector expansion after a transition period following a trade reform or the discovery of a natural resource.

Given that (4.13) holds, consider a typical period $0 < t < T-1$ during which all inherited debt is denominated in T goods and agents believe that at $t+1$ there will be a crisis with probability $1-\alpha$. Since in the good state in period t firms are solvent, internal funds are given by $\overline{w}_t = (1-c)\left(\overline{p}_t q_t - L_t\right)$. Since the debt burden equals $(1+r)b_{t-1} = (1+r)H^r w_{t-1}$ and output is $q_t = \theta I_{t-1} = \frac{\theta m^r w_{t-1}}{p_{t-1}}$, it follows that any equilibrium path of N-output and internal funds (q_t, w_t) must be a solution to

$$q_t = \theta \frac{m^r w_{t-1}}{m^r w_{t-1} + d} q_{t-1} \qquad t \leq T \tag{4.14}$$

$$w_t = \frac{1-c}{\eta^r - 1}\left[(1+r)H^r w_{t-1} - d\right], \qquad t < T \tag{4.15}$$

with initial conditions q_0 and $w_0 = e_0$, and where $\eta^r = (1-c)m^r > 1$ is the risky cash flow multiplier. The solution to (4.14)-(4.15) determines the 'lucky path,' along which no crisis occurs. The sequences of high and low prices associated with the lucky path are:

$$\bar{p}_{t+1} = \frac{d + m^r w_{t+1}}{q_{t+1}} \quad \text{and} \quad \underline{p}_{t+1} = \frac{d + m^s e}{q_{t+1}} \qquad 1 \leq t < T \tag{4.16}$$

The lucky path is part of an equilibrium provided that along this path (4.7) holds. That is, agents expect: (i) a sufficiently low price during a crisis, so that it is possible to claim the bailout subsidy by defaulting $(\hat{\pi}(\underline{p}_{t+1}) < 0)$; (ii) a sufficiently high return on investment in the absence of a crisis $(\theta \bar{p}_{t+1}/p_t > 1+r)$, and (iii) a sufficiently low probability of a crisis $(\alpha > \underline{\alpha})$, which ensures that the ex-ante expected return is high enough and credit constraints bind.

Since during a crisis, internal funds of the new cohort are $\underline{w}_{t+1} = e$, $\hat{\pi}(\underline{p}_{t+1}) < 0$ is equivalent to $\underline{p}_{t+1} q_{t+1} - L_{t+1} = d + m^r e - (1+r)H^r w_{t-1} < 0$. This condition holds provided w_{t-1} is high enough.

The return $\theta \bar{p}_{t+1}/p_t$ is high enough provided investment demand grows sufficiently fast relative to supply. Since tomorrow's supply is determined by today's investment, tomorrow's investment must grow fast enough. But, since borrowing constraints bind, this can only happen if internal funds grow fast enough. How can we ensure this will happen? It is apparent from (4.15) that if w_t is increasing over time, it will do so at an increasing rate. Thus, if initial internal funds e_0 are above a certain threshold and α is large enough, investment will have a positive NPV for all $t < T-1$ provided, of course, that investment is profitable at $T-1$.[19]

Since at the terminal time there is no investment, the T-sector must absorb all N-production. Thus, $p_T = \hat{d}/q_T$. This means that investment at $T-1$ is profitable only if the T-sector's demand shift at the terminal time (from d to $\hat{d}$) is large enough. Since managers choose safe plans at $T-1$, the positive NPV condition is equivalent to $\hat{d} > m^s(1+r)w_{T-1}$. Clearly, if $\hat{d}$ were not high enough, there would be no investment at $T-1$, and by backward induction there would be no investment throughout.

Suppose that a crisis hits at some time $\tau < T-1$. At the time of crisis internal funds collapse to e. Thereafter, managers will choose safe plans and will invest in N-production if the return is high enough. Along the post-crisis path all debt will be denominated in N-goods, so the debt burden will be $(1+r)H^s w_{t-1}$. Thus, N-output and internal funds evolve according to (4.14)-(4.15) replacing m^r by m^s, with initial conditions $q_\tau = \theta I_{\tau-1}$ and $w_\tau = e$.

We conclude that if initial internal funds are high enough ($e_0 > \underline{e_0}(d)$), there is a range of crisis probabilities, $(1-\alpha) \in (0, 1-\underline{\alpha}(e_0))$, for which internal funds increase over time, agents choose a risky debt structure and a crisis can occur during the next period with conditional probability $1-\alpha$. Along the lucky path the N-sector expands, running a deficit in anticipation of strong T-sector demand in the future. Debt and investment expenditure rise over time as the N-sector issues new debt to cover the sequence of deficits. A large shift in the T-sector demand in the final period ($\hat{d} > \underline{d}(e_0, \alpha, T)$) ensures that the accumulated debt can be repaid in case no crisis had occurred by $T-1$. In case a crisis occurs at

[19] Algebraically, $\theta p_{t+1}/p_t = [d + m^r w_{t+1}]/p_t I_t$. Thus, investment is profitable when $[d + m^r w_{t+1}]/m^r w_t > 1 + r$. This holds for all $t < T-1$ if $w_0 = e_0$ is above a certain threshold because w_{t+1}/w_t is increasing in w_t (by (4.15)).

some time τ, the economy follows a safe path thereafter. If internal funds in the aftermath of crisis are high enough ($e > \underline{e}(\tau)$), N-production will take place along the safe phase. Hence, there is a parameter region for which an equilibrium exists.

5. Linking the Model to the Stylized Facts

In this section we show that the evolution of the model economy along the equilibrium path resembles the typical boom-bust cycle described in Section 2.

In order to match the stylized facts it is necessary that both p_t and q_t rise along the lucky path. Although the *value* of output ($p_t q_t$) grows, p_t and q_t need not rise simultaneously. The technology parameter θ in (4.2) determines how the rise in value translates into changes in prices and quantities. If θ were very high, supply would outpace demand. As a result the price would fall over time, while investment would rise. At the other extreme, if θ were small, we could have an equilibrium along which nontradables become increasingly scarce while firms chase the returns offered by rising prices but can afford to invest less and less. To match the fact that N-sector growth coincides with a real *appreciation*, we fix θ at an intermediate value.

$$\theta \in \left(1,\ \frac{\eta^s h}{\eta^s - 1}\right) \tag{5.1}$$

Since along the equilibrium path credit constraints bind, credit is determined by N-sector's internal funds: $b_t = Hw_t$. Therefore, credit follows the same path as w_t. Initially credit grows slowly, but it accelerates over time because there is a strong balance sheet effect ($\eta_t > 1$). This generates a lending boom.

A strong balance sheet effect also implies that prior to a crisis a real appreciation coincides with a lending boom. This is because an increase in p_t deflates the real value of the debt burden and increases internal funds. This in turn increases future investment demand, which leads to a higher p_{t+1} and so on. Note, however, that a strong balance sheet effect also implies that a self-fulfilling real depreciation can lead to widespread bankruptcies in the N-sector and a protracted credit crunch. If a crisis occurs at τ, the real exchange rate depreciates from $\bar{p}_{\tau-1} = \frac{d+m^r w_{\tau-1}}{q_{\tau-1}}$ to $\underline{p}_\tau = \frac{d+m^s e}{q_\tau}$, N-sector firms become insolvent and internal funds collapse to a level e. This generates a drop in investment that validates the real depreciation.

Let us define a 'credit-crunch' as a declining path of the credit-to-GDP ratio. In equilibrium GDP ($q_t^{tr} + p_t q_t^{nt}$) evolves according to $GDP_t = \varepsilon q_{t-1}^{tr} + d + m_t w_t$, and

credit is given by $b_t = (m_t - 1)w_t$. Since in the aftermath of a crisis internal funds collapse ($w_\tau = e$), the growth rate of credit falls (because a strong balance sheet effect implies that w_t/w_{t-1} is increasing in w_t). On the other hand, the growth rate of tradables production remains unchanged. As a result, in the aftermath of crisis the credit-to-GDP ratio follows a declining path for a while until internal funds recover.

Note that if e is below a critical level, GDP declines at the time of the crisis. Thereafter, the recession might continue for a few more periods. However, since the T-sector continues to grow in the aftermath of a crisis, a resumption of GDP growth can coexist with a deepening credit crunch.

Now consider the asymmetric sectorial pattern: the N-sector outperforms the T-sector during the boom, while the opposite is true during the bust. In the model T-output grows at a rate: $g^{tr} = \varepsilon - 1$, while the growth rate of N-output ($g_t^{nt} = \frac{q_t}{q_{t-1}} - 1$) is given by (4.14). Thus the growth differential is given by

$$g_t^{nt} - g^{tr} = \frac{\theta m_t w_{t-1}}{m_t w_{t-1} + d} - \varepsilon$$

This equation states that the fraction of N-production that is invested by the N-sector depends on the financial strength of the N-sector. If internal funds are low, N-firms can borrow very little. Holding supply fixed, weak investment demand implies that the price is low and the T-sector absorbs a large fraction of N-output. Thus, there can be an initial period during which the T-sector outpaces the N-sector. However, along the lucky path internal funds grow gradually. Thus, the N-sector is able to borrow more over time, and is able to bid a greater share of N-supply away from the T-sector. In other words, both w_t and g_t^{nt} accelerate over time. Therefore, if the boom lasts long enough, there is a time when the N-sector will start to grow faster than the T-sector.

During the crisis internal funds collapse to e. This collapse in N-firms' internal funds leads to a fall in both N-output and its growth rate ($g_{\tau+1}^{nt} < 0$). Thereafter, if ε is relatively high, g_t^{nt} will remain below g^{tr} for a while until internal funds have grown sufficiently. We thus have a simple version of the asymmetric sectorial pattern that actually takes place during boom-bust cycles. Clearly, in a less stylized model, in which T-production is decreasing in p_t, the amplitude of the cycles experienced by the N/T ratio would be greater.

Finally, we would like to emphasize that the typical lending boom in the model economy need not end in crisis. Furthermore, the *likelihood of self-fulfilling crises*

is not a free parameter. Equilibria exist only if the probability of crisis during a given period $(1-\alpha)$ is small. If crises were not rare events, low ex ante returns would discourage managers from investing in the first place.

6. Conclusions

This paper makes three key points. First, the financial liberalizations implemented by middle income countries during the last two decades have been typically followed by boom-bust cycles. These cycles have many features that are common across countries.

The second point is that the co-movements of key macroeconomic variables along the boom-bust cycle are quite different from the ones observed in countries with well developed financial markets like the US. They indicate an asymmetry in financing opportunities across sectors, a severe currency mismatch and strong balance sheet effects.

The third point we make is that the co-movements of credit, the real exchange rate and the ratio of nontradables-to-tradables output, as well as the occurrence of twin crises can be rationalized by combining credit market imperfections with institutions that cover private losses during systemic crises.

Lots of empirical work remains to be done in order to better characterize the mechanisms that underlie the boom-bust cycle. For instance, it is important to develop firm level data sets that will cover several countries and that will allow us to classify firms along several dimensions (for instance, small vs. large, nontradables vs. tradables, etc.). Furthermore, these data sets should allow researchers to obtain information regarding investment opportunities and sources of external finance (e.g., bank credit, equity, bonds). Also, it is important to have a better understanding of the types of bailout guarantees which are prevalent in different economies, and the enforceability problems that pervade bank contracts in different countries.

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Figure 1: Real Appreciation

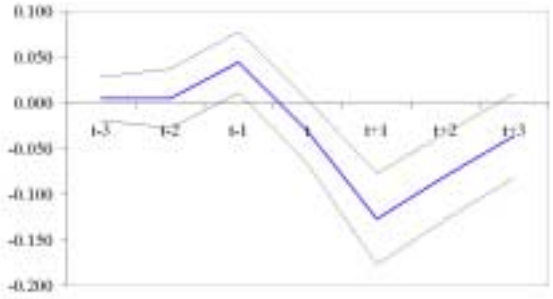
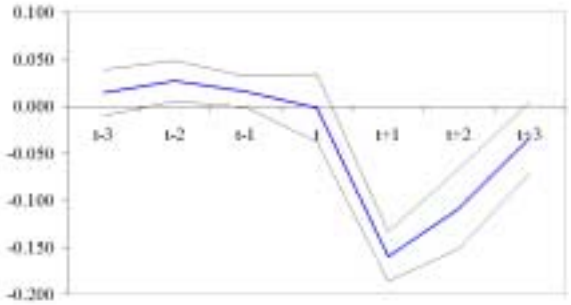
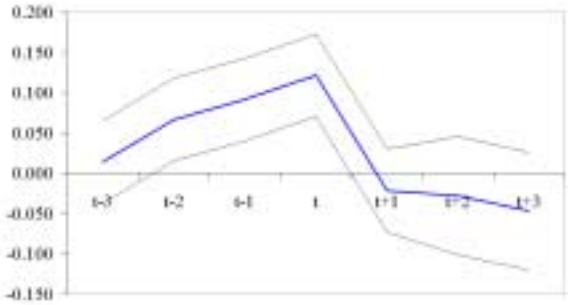


Figure 2: Bank Credit

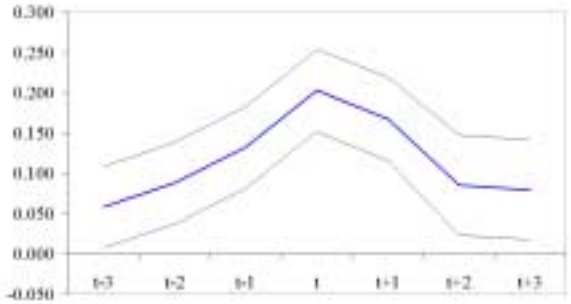
a) Real Credit (growth rates)



b) Real Credit (deviations from HP-Trend)



c) Credit/GDP



d) Credit/Deposits

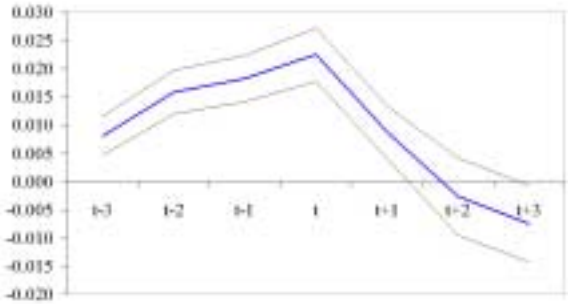
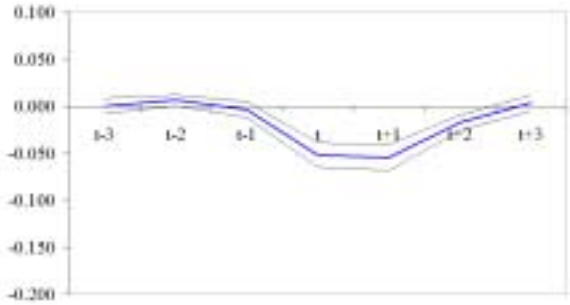


Figure 3: Aggregate Output

a) Real GDP (growth rates)



b) Real GDP (deviations from HP-Trend)

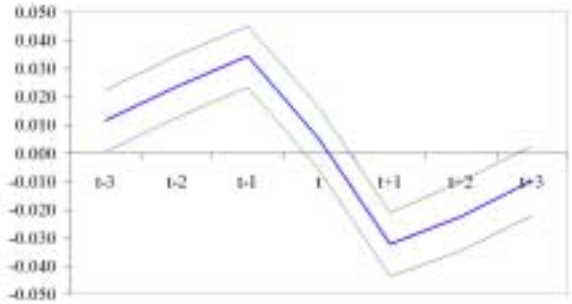


Figure 4: Non-tradables-to-Tradables Output Ratio

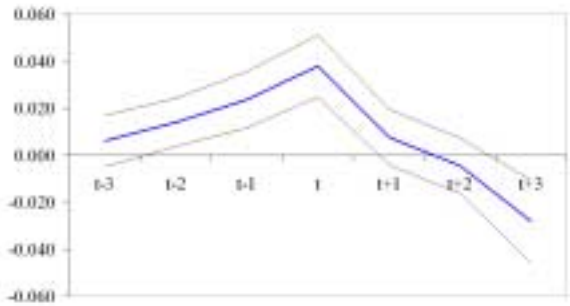


Figure 5: Interest Rate Spread

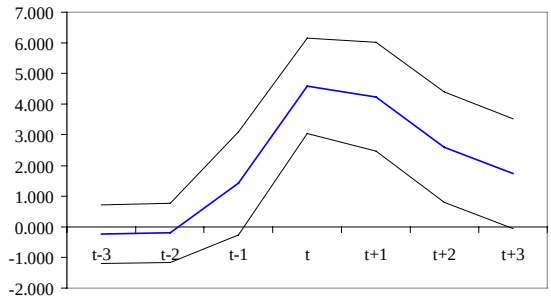
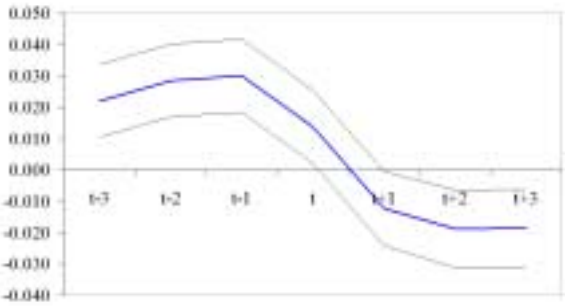
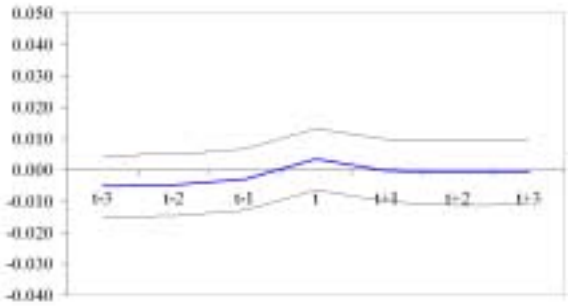


Figure 6: Components of GDP

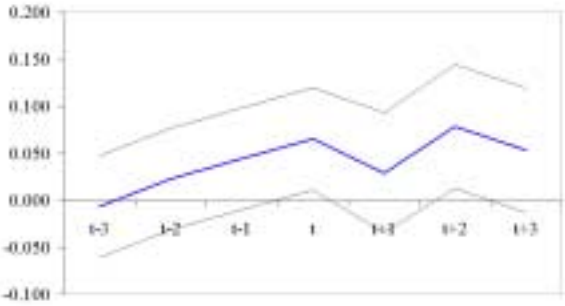
a) Investment/GDP



b) Consumption/GDP



c) Government Expenditure/GDP



d) Net Exports/GDP

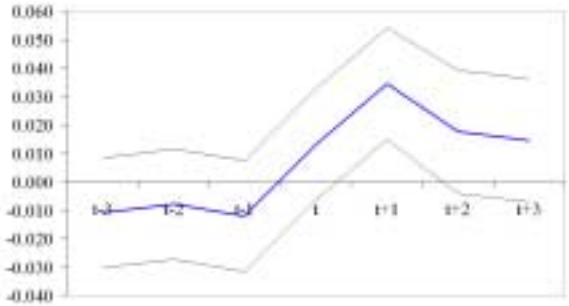
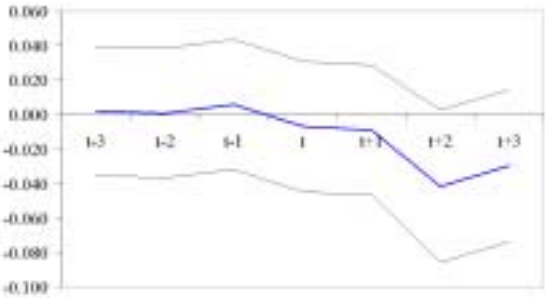


Figure 7: External Shocks?

a) Terms of Trade



b) US Federal Funds Rate

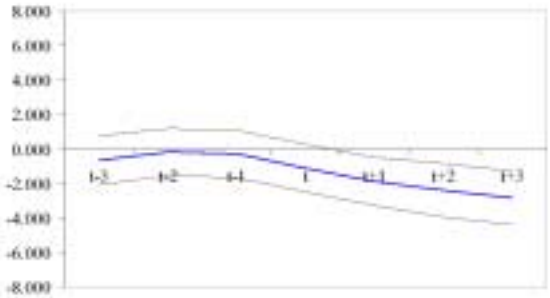
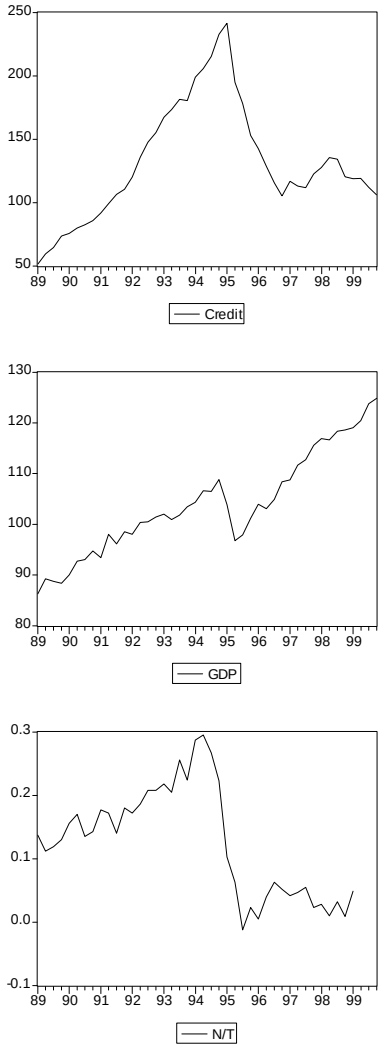
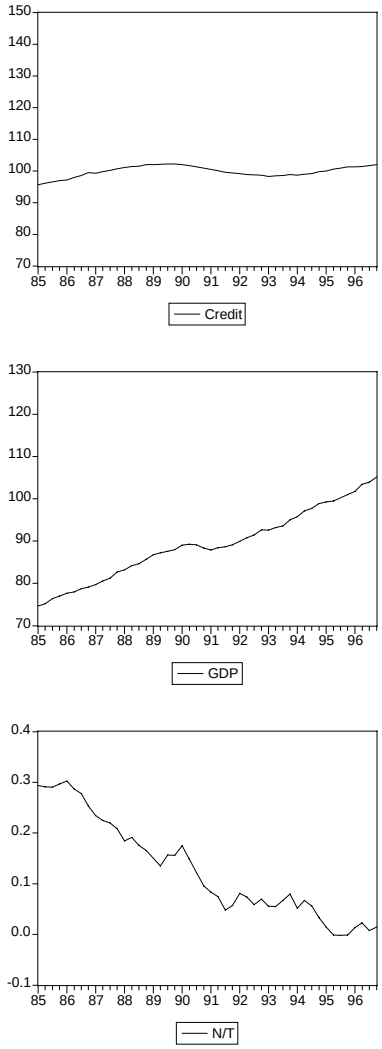


Figure 8: Credit, GDP and N/T in Mexico and the US

Mexico



United States

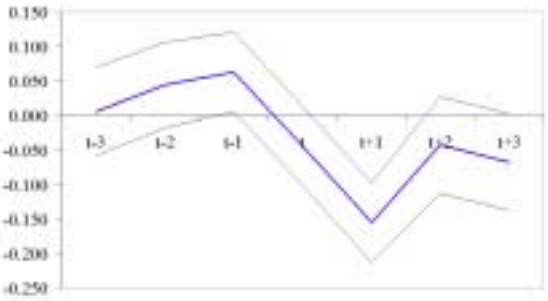


Note: The figures display the time path of real domestic credit, the real exchange rate and the ratio of non-tradable to tradable output, as proxied by Construction and Manufacturing.

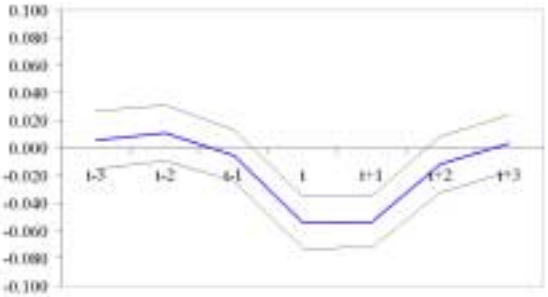
Figure 9: The boom bust cycle under fixed and non-fixed exchange rate regimes (de facto classification)

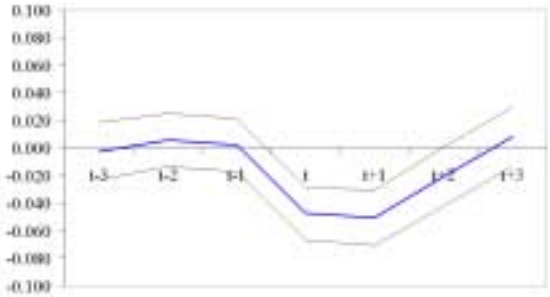
Fixed **Non-Fixed**

Real Appreciation

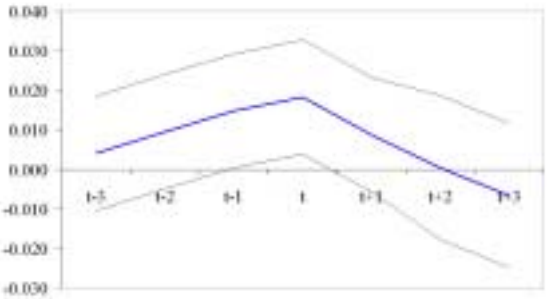


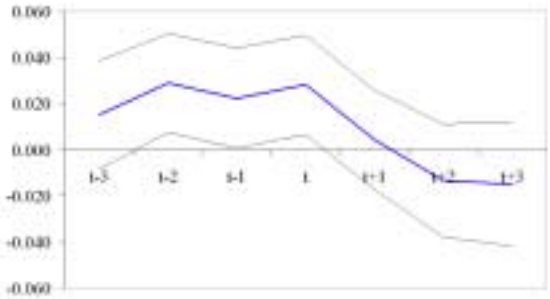
Aggregate Output



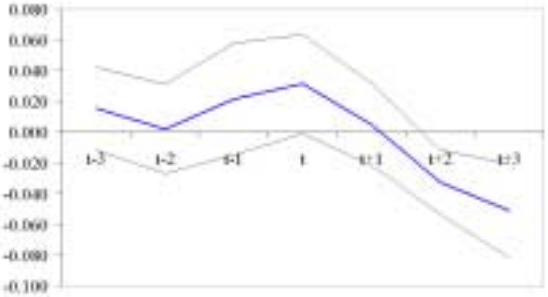


Credit/Deposits





Non-tradables-to-Tradables Output Ratio



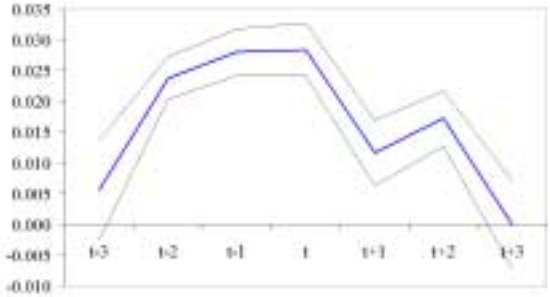
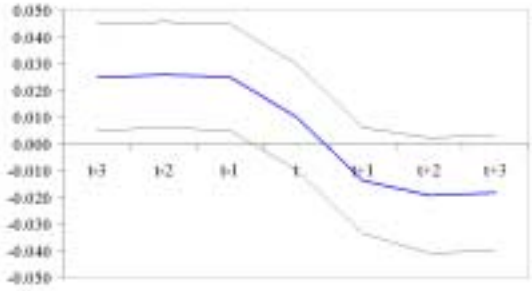
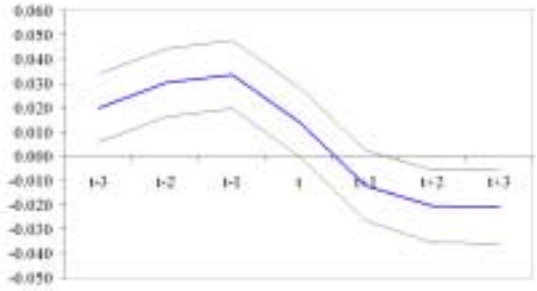


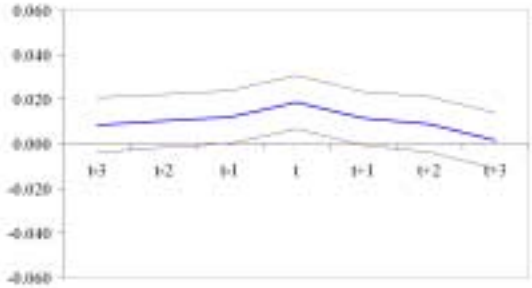
Figure 9: Continued

Investment/GDP





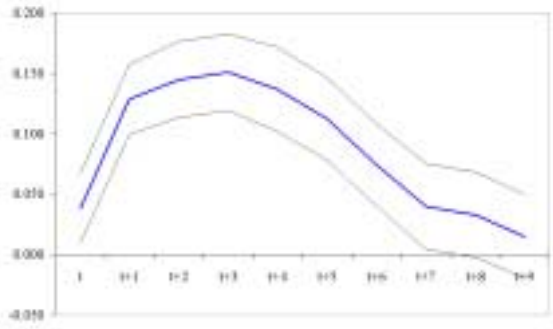
Consumption/GDP

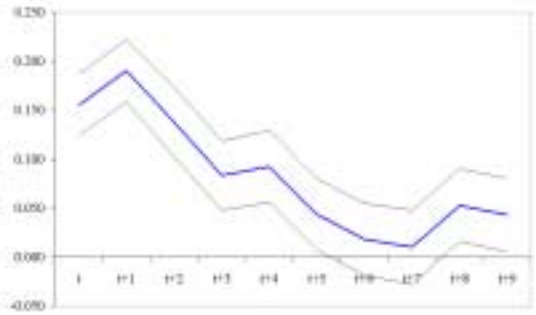


Note: Fixed and non-fixed regimes are determined according to the de facto classification by Levy-Yeyati and Sturzenegger (2001). For the construction of the event windows see footnote to figure 1.

Figure 10: Soft Landing

a) Deviation from HP-Trend **b) Growth rates**

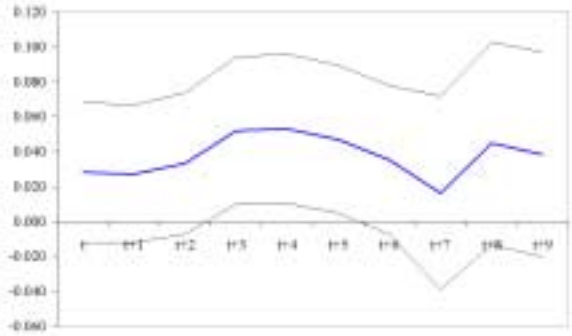


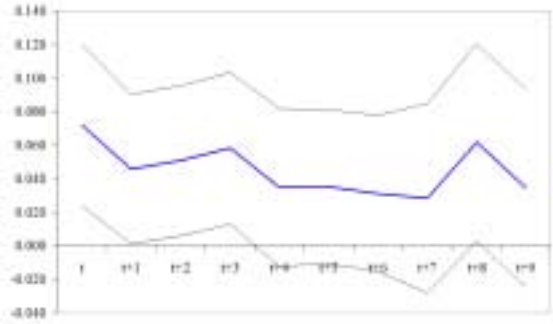


Note: The event windows in figure 10 are centered around the beginnings of lending booms. The beginning of the lending boom is the fist year of a period of at least 2 years with more that 10% real credit growth. For the construction of the event windows see footnote to figure 1.

Figure 11: Real Credit after Financial Liberalization

a) Deviation from an HP-trend **b) Growth rates**





Note: The event windows in figure 10 are centered dates of financial liberalization. Dates for financial liberalization are taken from Baekert et.al (2001)

Table 1: Probability of a crisis given a lending boom (and vice versa)

	LB2	LB3	LB4
Pr(crisis in j+1 | LB (j))	6.9%	6.7%	6.7%
Pr(crisis in j+2 | LB (j))	6.3%	5.6%	8.9%
Pr(crisis in j+3 | LB (j))	5.7%	5.6%	6.7%
Pr(crisis in tranquil times)	3.9%	4.6%	4.6%
Pr(LB | Crisis (j))	91.1%	51.7%	31.0%

Note: LB 2-4 denotes 3 different definitions of a lending boom. LB2 is a period of a cumulative increase in real credit over the past 2 years of more than 20% (30% for LB3 and 40% for LB4). Pr(crisis in j+i | LB (j)) with i=1..3 denotes the probability of a crisis during the year j+i. Pr(crisis in tranquil times) denotes the probability of a crisis in all other years. Pr(LB | Crisis (j)) denotes the probability that a lending boom was present within the 3 years before the crisis or during the year of the crisis .

Table 2: Co-movement of real credit growth with other macro variables

Variable		Reg. 1	Reg. 2	Reg. 3	Reg. 4	Reg. 5
1/Real Exchange Rate		0.421	0.264	0.308	0.435	0.307
	St. Er.	0.062	0.070	0.081	0.068	0.073
	P-val.	0.000	0.000	0.000	0.000	0.000
N/T		0.302	0.168	0.166	0.317	0.171
	St. Er.	0.051	0.087	0.084	0.056	0.074
	P-val.	0.000	0.056	0.049	0.000	0.022
Real Investment			0.241	0.297		0.327
	St. Er.		0.066	0.073		0.067
	P-val.		0.000	0.000		0.000
Real GDP				-0.383	0.347	0.044
	St. Er.			0.304	0.169	0.290
	P-val.			0.210	0.041	0.881
Crisis/GDP Interact. Dummy					-0.802	-1.293
	St. Er.				0.317	0.382
	P-val.				0.012	0.001
Adjusted R-squared		0.340	0.377	0.377	0.353	0.407
Durbin-Watson stat.		1.670	1.600	1.605	1.670	1.693

Note: Domestic credit is the dependent variable. All panel data regressions are estimated allowing for fixed effects and a GLS estimator. All variables enter the regression in growth rates. Standard errors and P-values are given below the point estimates. The interaction dummy for GDP is equal to 1 from period, t to t+3 of the crisis and is zero otherwise. The variable ”Real GDP Interaction Dummy” is this dummy*(real GDP).

Appendix

Criteria for country selection:

In the world bank development indicators data base, we consider countries:

a) That have a stock market and the value of the stocks traded as a share of GDP is larger than 1%.
b) That have a population of more than 1 million people.
c) With per capita income of more than 1000$ but less than 18000$
d) That are not engaged in war or civil war (Iran, Irak, Yugoslavia and lebanon)

In addition, we consider Finland and Sweden, who experienced often studied joint currency and banking crisis. In total we have 39 countries. The sample covers 20 years, from 1980 to 1999. The panel is unbalanced, as not all series cover the full sample or are available for all countries. The data set is available from the authors upon request.

Crisis dates:

Banking Crisis (BC) and Currency Crisis (CC) dates are taken from Frankel and Rose (1996), Capiro and Klingbiel (1997) and Tornell (1999). A Joint crisis is defined as an event where A) BC and CC occurs in the same year, or consecutive years. B) in consecutive years, the year of the crisis is the year of the latter of the two. C) A joint crisis does not count if it occurs within three year before or after another joint crisis, or when crisis occur three or more years in a row. Out of our sample of 39 countries, 20 have experienced joint crises. The remaining 19 are part of the control group and effect the regression results only via affecting the mean of tranquil times.

	CC	BC	Joint		CC	BC	Joint		CC	BC	Joint		CC	BC	Joint
Argentina *	82, 84, 87, 89, 91, 95	80, 85, 89, 94	85, 89, 95	Greece	83, 85	-	-	Mexico *	82, 85, 88, 94	81, 94	82, 94	Slovenia	-	-	-
Brazil *	87, 90, 95, 98	90, 94	90, 95	Hungary	-	91	-	Morocco *	81	82, 95	82	South Africa	81, 82, 84, 86, 88, 92, 95	85	85
Chile *	82, 84	81	82	Indonesia *	83, 86, 97	92, 97	97	New Zealand *	80, 84, 88	87	88	Spain	82, 92, 94	-	-
Colombia	-	82	-	Ireland	86, 92	-	-	Peru *	84, 88, 90, 92	83	84	Sweden *	92	91	91
Croatia	-	-	-	Israel	-	-	-	Philippines *	82, 83, 86, 90, 97	81, 97	97	Thailand *	97	83, 97	97
Czech Republic	-	-	-	Jordan *	89	89	89	Poland	-	-	-	Tunisia	-	-	-
Ecuador *	82, 84, 85, 88, 91, 98	81, 98	82, 98	Korea, Rep. *	80, 97	97	97	Portugal	83	-	-	Turkey *	84, 91, 94, 95	82, 91, 94	91, 94
Egypt *	89	90	90	Latvia	-	-	-	Russia	-	98	-	Uruguay *	82, 83, 86	81	82
Estonia	-	-	-	Lithuania	-	-	-	Saudi Arabia	-	-	-	Venezuela *	86, 89, 92, 94, 95	80, 92, 94	92
Finland *	86, 91, 93	91	91	Malaysia *	97	85, 97	97	Slovak Republic	-	-	-				

Indicators of tadability in Manufacturing and Services:

	Standard deviations of the sectoral real exchange rate		Exports / GDP	
	manufacturing	services	manufacturing	services
ARG	0.239	0.348	0.343	0.029
BRA	0.185	0.238	0.340	0.018
CHL	0.259	0.338	1.261	0.086
COL	0.236	0.267	0.723	0.049
CRO	0.100	0.127	1.264	0.402
CZE	NA	0.123	NA	0.231
ECU	0.156	0.342	1.080	0.075
EGY	0.416	0.458	0.614	0.245
EST	0.301	0.369	2.238	0.324
FIN	0.130	0.142	1.129	0.092
GRC	0.079	0.081	0.685	0.130
HUN	0.029	0.281	1.420	0.138
IDN	0.262	0.410	1.304	0.048
IRL	NA	NA	NA	0.127
ISR	NA	NA	NA	NA
JOR	0.225	0.307	1.774	0.438
KOR	0.138	0.148	0.967	0.089
LTU	0.571	0.652	1.892	0.161
LVA	0.542	0.478	1.283	0.268
MEX	0.148	0.264	0.855	0.040
MOR	0.141	0.242	0.950	0.122
MYS	0.149	0.207	2.639	0.200
NZL	0.145	0.163	1.126	0.092
PER	0.243	0.229	0.460	0.051
PHL	0.120	0.154	0.853	0.180
POL	NA	NA	1.013	0.101
PRT	0.133	0.175	0.810	0.123
RUS	NA	0.355	NA	0.065
SAU	0.315	0.236	5.861	0.087
SLK	NA	0.082	1.984	0.224
SLN	0.086	0.085	1.852	0.227
SOU	0.175	0.188	1.131	0.062
SPA	0.117	0.139	0.611	0.139
SWE	0.108	0.111	1.320	0.106
THA	0.088	0.170	0.992	0.140
TUN	0.223	0.204	1.652	0.219
TUR	0.134	0.127	0.656	0.113
URU	0.223	0.310	0.668	0.108
VEN	0.321	0.414	1.363	0.032

Note: We would expect non-tradables sectors to experience a higher sectoral real exchange rate variance. We consider 3 sectors: construction, services and Manufacturing. We proxy for tradables and non-tradables output in the following way. If there exists construction data, we classify construction as N by default. We then classify as T the sector that exhibits the least variable sectoral real exchange rate. If construction data are not available, we classify as non-tradable the sector with the least variable exchange rate. The table presents information that helps to classify Manufacturing as N or T.

The Boom Bust Cycle

The graphs in the text illustrate the typical pattern of a boom-burst cycle in emerging markets around events that are characterized by both, banking and currency crisis. The graphs are visual representations of the point estimates and standard errors from the regression exercise – here we report the parameter estimates for a more exact evaluation of the level of significance. The regressions are specified with the respective variable in the graph as dependent variable, regressed on dummy variables proceeding and following a crisis. We estimate the following pooled regression:

$$y_{it} = a_i + \sum_{j=-3}^{3} \beta_j Dummy_{t+j} + \varepsilon_{it},$$

where y is the respective variable of interest in the graph, i = 1..39 denotes the 39 countries in our sample listed below, t = 1980..1999, and $Dummy_{t+j}$ with $j = -3...+3$ is a dummy variable j periods before or after the crisis. As the mean of the variable is likely to be different across countries we allow for country specific fixed effects in the regression, i.e. we estimate a intercept for each pool member α_i. Also, in order to avoid the possibility that a country with high variance influences the parameter estimates by large changes in either direction, we apply a GLS weighing scheme, using the estimated cross section residual variances. This captures the presence of cross section heteroscedasticity.

1/ Real exchange rate (growth rates)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Dummy T-3	0.005	0.012	0.387	0.699
Dummy T-2	0.005	0.017	0.278	0.781
Dummy T-1	0.044	0.017	2.592	0.010
Dummy T	-0.032	0.018	-1.780	0.076
Dummy T+1	-0.127	0.026	-4.961	0.000
Dummy T+2	-0.080	0.024	-3.316	0.001
Dummy T+3	-0.036	0.023	-1.537	0.125

Note: The graphs show the behavior of the real effective exchange rate (REER), based on CPI's. REER'S are computed as a weighted geometric average of the level of consumer prices in the home country, relative to that of the trading partners. For country i , it is defined as $REER_i = \prod_{j \neq i} \left[\frac{P_i R_i}{P_j R_j} \right]^{W_{ij}}$, where j denotes 1..j trading partners, Wij is a competitiveness weight put by country i on country j (The weighting scheme is based on trade in Manufacturing, non-oil primary commodities and tourism services). P denotes the CPI's. R denotes the nominal exchange rate of currencies in US Dollars.

Real Credit (deviations from HP-Trend)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Dummy T-3	0.014	0.026	0.534	0.593
Dummy T-2	0.067	0.026	2.552	0.011
Dummy T-1	0.092	0.026	3.493	0.001
Dummy T	0.122	0.026	4.654	0.000
Dummy T+1	-0.021	0.026	-0.810	0.418
Dummy T+2	-0.028	0.037	-0.748	0.455
Dummy T+3	-0.047	0.037	-1.256	0.210

Note: "Credit" is the credit provided by domestic deposit money banks to the non-government -, non financial institution – private Sector. The Hodrick-Prescott trend is constructed by minimizing the following objective

function S, with respect to y_t^p, the trend component in output :

$$S = \sum_{t=1}^{T} (y_t - y_t^p)^2 + \lambda \sum_{t=2}^{T-1} \left[(y_{t+1}^p - y_t^p) - (y_t^p - y_{t-1}^p) \right], \text{ with } \lambda = 100.$$

Real credit (growth rates)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Dummy T-3	0.014	0.012	1.155	0.249
Dummy T-2	0.027	0.011	2.446	0.015
Dummy T-1	0.015	0.008	1.851	0.065
Dummy T	-0.002	0.018	-0.090	0.928
Dummy T+1	-0.160	0.014	-11.813	0.000
Dummy T+2	-0.109	0.022	-5.024	0.000
Dummy T+3	-0.033	0.019	-1.712	0.087

Note: “Credit” is the credit provided by domestic deposit money banks to the non-government -, non financial institution – private Sector.

Credit/GDP (levels)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Dummy T-3	0.058	0.026	2.258	0.024
Dummy T-2	0.088	0.026	3.413	0.001
Dummy T-1	0.132	0.026	5.104	0.000
Dummy T	0.203	0.026	7.824	0.000
Dummy T+1	0.167	0.026	6.342	0.000
Dummy T+2	0.085	0.032	2.696	0.007
Dummy T+3	0.079	0.032	2.515	0.012

Credit/Deposits (levels)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Dummy T-3	0.008	0.002	4.580	0.000
Dummy T-2	0.016	0.002	7.934	0.000
Dummy T-1	0.018	0.002	8.754	0.000
Dummy T	0.022	0.002	9.366	0.000
Dummy T+1	0.009	0.002	3.704	0.000
Dummy T+2	-0.003	0.003	-0.770	0.442
Dummy T+3	-0.008	0.003	-2.186	0.029

Note: Deposits are the sum of demand deposits and time-, savings- and foreign currency deposits, by domestic deposit money banks.

Real GDP (deviations from HP-Trend)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Dummy T-3	0.012	0.006	2.091	0.037
Dummy T-2	0.024	0.006	4.256	0.000
Dummy T-1	0.034	0.006	6.165	0.000
Dummy T	0.005	0.006	0.906	0.366
Dummy T+1	-0.032	0.006	-5.610	0.000
Dummy T+2	-0.022	0.006	-3.583	0.000
Dummy T+3	-0.010	0.006	-1.566	0.118

Real GDP (growth rates)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Dummy T-3	0.000	0.004	0.028	0.977
Dummy T-2	0.007	0.003	2.214	0.027
Dummy T-1	-0.004	0.004	-0.881	0.379
Dummy T	-0.052	0.006	-7.984	0.000
Dummy T+1	-0.054	0.007	-7.731	0.000
Dummy T+2	-0.018	0.004	-4.249	0.000
Dummy T+3	0.003	0.004	0.774	0.439

N/T (levels)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Dummy T-3	0.006	0.006	1.087	0.278
Dummy T-2	0.014	0.005	2.643	0.009
Dummy T-1	0.024	0.006	3.844	0.000
Dummy T	0.038	0.007	5.669	0.000
Dummy T+1	0.008	0.006	1.256	0.210
Dummy T+2	-0.004	0.006	-0.749	0.454
Dummy T+3	-0.028	0.009	-3.133	0.002

Note: Construction, Services and Manufacturing where classified as N or T, according to the variance of the sectorial real exchange rate. In cases where sectoral price data where not available for construction, Construction was classified as N by default.

Terms of Trade (levels)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Dummy T-3	0.002	0.019	0.105	0.916
Dummy T-2	0.001	0.019	0.044	0.965
Dummy T-1	0.006	0.019	0.307	0.759
Dummy T	-0.007	0.019	-0.358	0.720
Dummy T+1	-0.009	0.019	-0.469	0.639
Dummy T+2	-0.042	0.023	-1.835	0.067
Dummy T+3	-0.030	0.023	-1.318	0.188

US Federal Funds Rate (Levels)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Dummy T-3	-0.655	0.731	-0.897	0.370
Dummy T-2	-0.167	0.699	-0.240	0.811
Dummy T-1	-0.284	0.702	-0.405	0.686
Dummy T	-1.119	0.705	-1.587	0.113
Dummy T+1	-1.878	0.713	-2.636	0.009
Dummy T+2	-2.395	0.791	-3.027	0.003
Dummy T+3	-2.841	0.788	-3.606	0.000

Interest rate spread (levels)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Dummy T-3	-0.239	0.487	-0.491	0.625
Dummy T-2	-0.200	0.487	-0.411	0.682
Dummy T-1	1.420	0.859	1.653	0.102
Dummy T	4.602	0.799	5.759	0.000
Dummy T+1	4.246	0.908	4.676	0.000
Dummy T+2	2.603	0.918	2.837	0.006
Dummy T+3	1.734	0.918	1.890	0.062

Note: The interest rate spread is the interest rate charged by banks on loans to prime customers minus the interest rate paid by commercial or similar banks for demand, time, or savings deposits. This graph only contains data for 11 countries out of the full set of 39.

Investment/GDP (levels)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Dummy T-3	0.022	0.006	3.736	0.000
Dummy T-2	0.028	0.006	4.814	0.000
Dummy T-1	0.030	0.006	5.067	0.000
Dummy T	0.014	0.006	2.317	0.021
Dummy T+1	-0.012	0.006	-2.034	0.042
Dummy T+2	-0.019	0.006	-2.967	0.003
Dummy T+3	-0.019	0.006	-2.930	0.004

Consumption/GDP (levels)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Dummy T-3	-0.005	0.005	-1.022	0.307
Dummy T-2	-0.005	0.005	-0.976	0.329
Dummy T-1	-0.003	0.005	-0.603	0.547
Dummy T	0.003	0.005	0.681	0.496
Dummy T+1	0.000	0.005	-0.051	0.960
Dummy T+2	-0.001	0.005	-0.145	0.885
Dummy T+3	-0.001	0.005	-0.125	0.900

Net exports (as % of GDP)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Dummy T-3	-0.011	0.010	-1.111	0.267
Dummy T-2	-0.008	0.010	-0.800	0.424
Dummy T-1	-0.012	0.010	-1.226	0.221
Dummy T	0.013	0.010	1.318	0.188
Dummy T+1	0.035	0.010	3.456	0.001
Dummy T+2	0.018	0.011	1.588	0.113
Dummy T+3	0.014	0.011	1.314	0.189

Government expenditure (as % of GDP)

Variable	Coefficient	Std. Error	t-Statistic	Prob.

Dummy T-3	-0.007	0.028	-0.250	0.803
Dummy T-2	0.023	0.028	0.826	0.409
Dummy T-1	0.044	0.028	1.600	0.110
Dummy T	0.065	0.028	2.352	0.019
Dummy T+1	0.029	0.033	0.886	0.376
Dummy T+2	0.078	0.034	2.334	0.020
Dummy T+3	0.053	0.034	1.578	0.115

Soft Landing (Deviation from HP-Trend)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Dummy T	0.038	0.015	2.597	0.010
Dummy T+1	0.128	0.015	8.664	0.000
Dummy T+2	0.145	0.016	9.029	0.000
Dummy T+3	0.151	0.016	9.350	0.000
Dummy T+4	0.137	0.018	7.674	0.000
Dummy T+5	0.112	0.017	6.492	0.000
Dummy T+6	0.074	0.017	4.271	0.000
Dummy T+7	0.040	0.018	2.202	0.028
Dummy T+8	0.033	0.018	1.831	0.068
Dummy T+9	0.015	0.018	0.842	0.400

Note: the beginning of the lending boom is the fist year of a period of at least 2 years with more that 10% real credit growth.

Soft Landing (growth rates)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Dummy T	0.156	0.016	9.749	0.000
Dummy T+1	0.191	0.016	11.751	0.000
Dummy T+2	0.138	0.018	7.627	0.000
Dummy T+3	0.083	0.018	4.603	0.000
Dummy T+4	0.092	0.019	4.970	0.000
Dummy T+5	0.044	0.018	2.368	0.018
Dummy T+6	0.018	0.019	0.951	0.342
Dummy T+7	0.010	0.019	0.512	0.609
Dummy T+8	0.053	0.019	2.804	0.005
Dummy T+9	0.043	0.019	2.241	0.026

Financial liberalization: Deviation of real credit from HP-Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Dummy T	0.028	0.021	1.371	0.171
Dummy T+1	0.027	0.020	1.352	0.177
Dummy T+2	0.033	0.021	1.611	0.108
Dummy T+3	0.052	0.021	2.427	0.016
Dummy T+4	0.053	0.022	2.430	0.016
Dummy T+5	0.047	0.022	2.169	0.031
Dummy T+6	0.035	0.022	1.619	0.106
Dummy T+7	0.016	0.028	0.578	0.564
Dummy T+8	0.045	0.030	1.505	0.133
Dummy T+9	0.038	0.030	1.286	0.199

Note: Dates for financial liberalization are taken from Baekert et.al (2001)

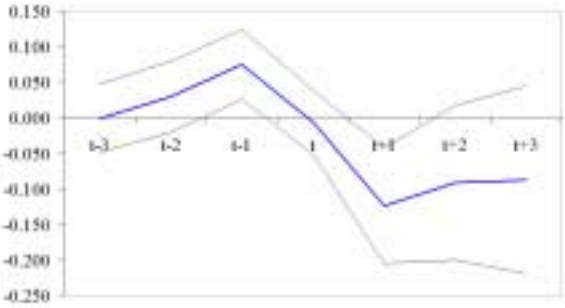
Financial liberalization: Growth rate of real credit

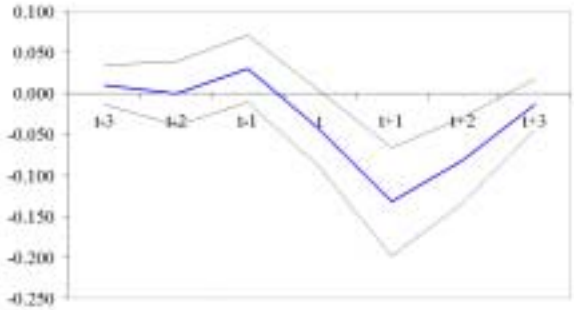
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Dummy T	0.072	0.024	2.940	0.004
Dummy T+1	0.046	0.023	2.016	0.045
Dummy T+2	0.051	0.023	2.220	0.027
Dummy T+3	0.058	0.023	2.525	0.012
Dummy T+4	0.035	0.024	1.460	0.145
Dummy T+5	0.035	0.023	1.504	0.133
Dummy T+6	0.031	0.024	1.323	0.187
Dummy T+7	0.028	0.029	0.983	0.326
Dummy T+8	0.062	0.030	2.061	0.040
Dummy T+9	0.034	0.030	1.142	0.254

Figure A: The boom bust cycle under fixed and non-fixed exchange rate regimes (de jure classification)

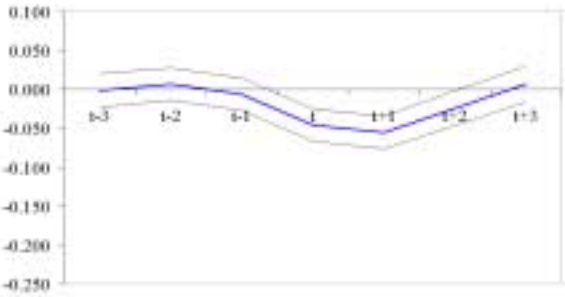
Fixed **Non-Fixed**

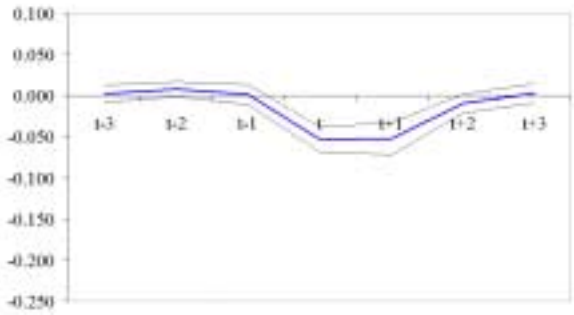
Real Appreciation



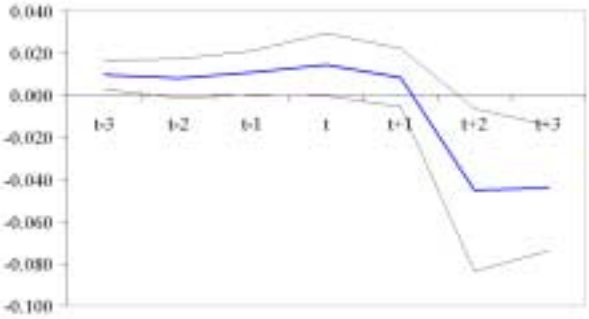


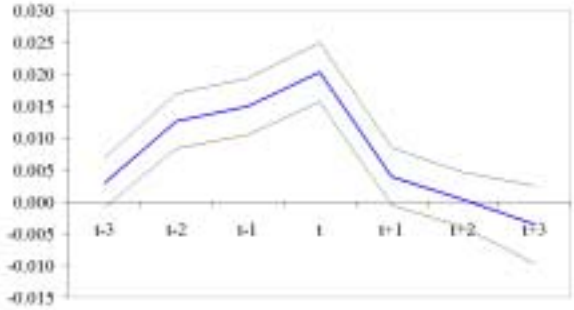
Aggregate output



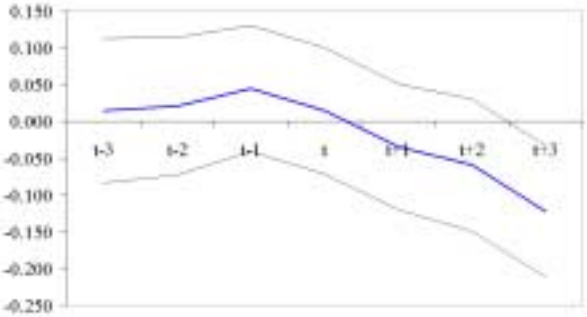


Credit/Deposits





Non-tradables-to-Tradables Output Ratio



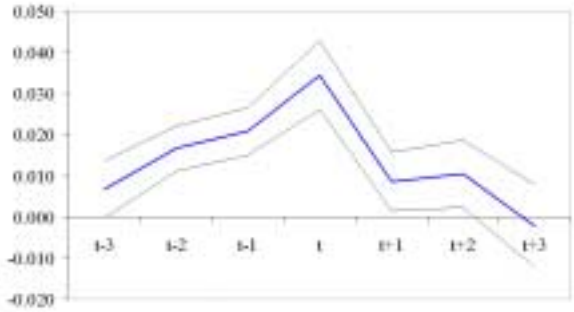
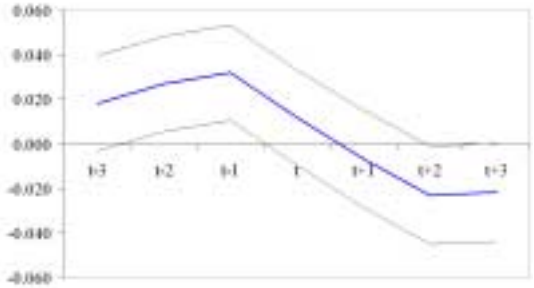
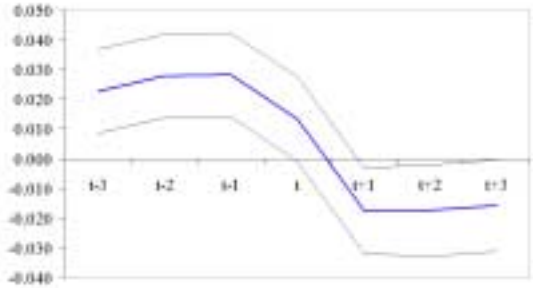


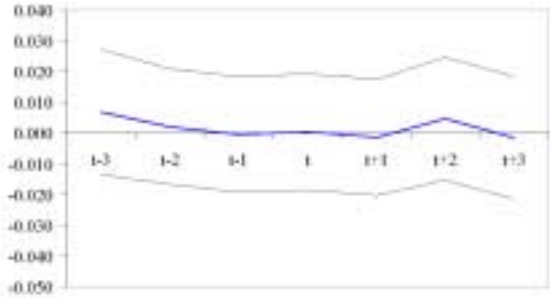
Figure A: Continued

Investment/GDP





Consumption/GDP

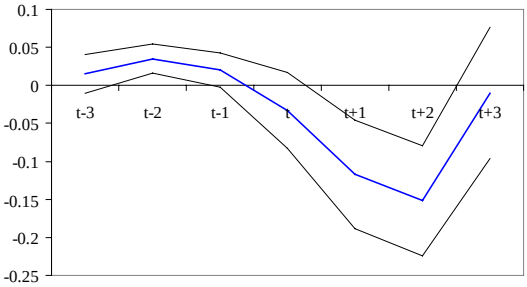


Note: Fixed and non-fixed regimes are determined according to the de Jure classification by Berger et. al (2001). For the construction of the event windows see footnote to figure 1.

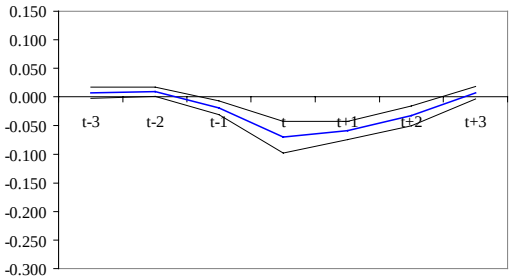
Figure B: the boom bust cycle in 11 frequently studied countries:

Argentina, Brazil, Chile, Indonesia, Finland, Korea, Malaysia, Mexico, Philippines, Sweden, Thailand

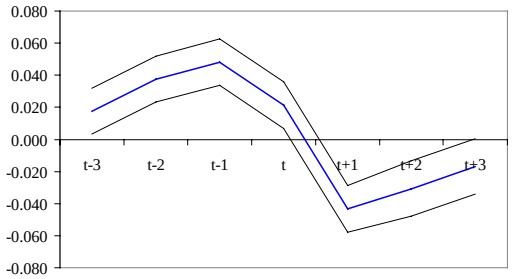
1/ Real Exchange Rate (growth rates)



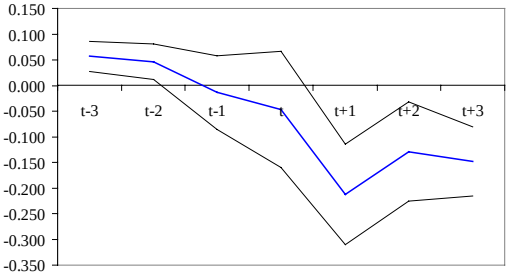
Real GDP (growth rates)



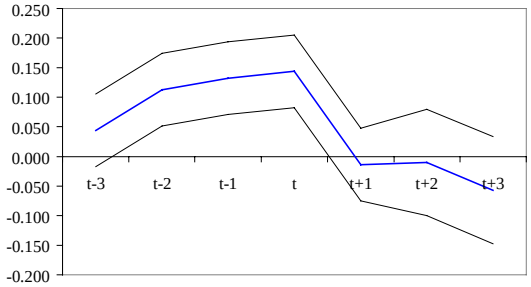
Real GDP – deviations from HP-Trend



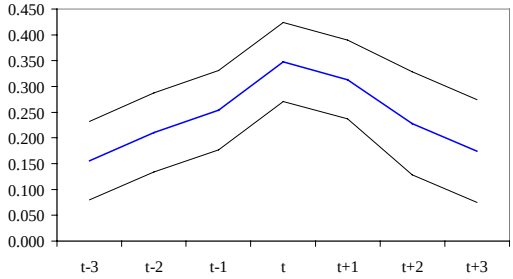
Real credit (growth rates)



Real Credit – dev. from HP-Trend



Credit/GDP (levels)



Credit/Deposits (levels)

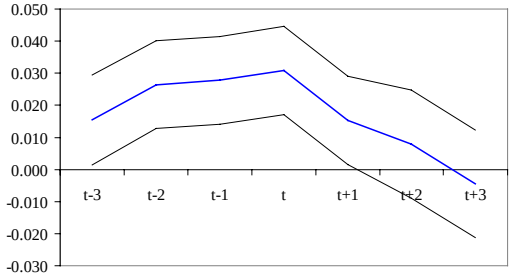
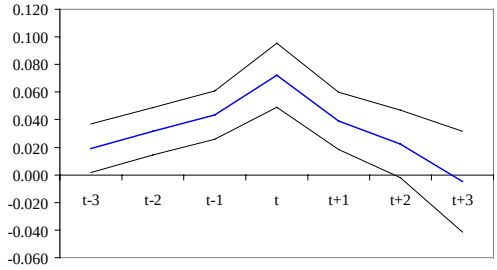
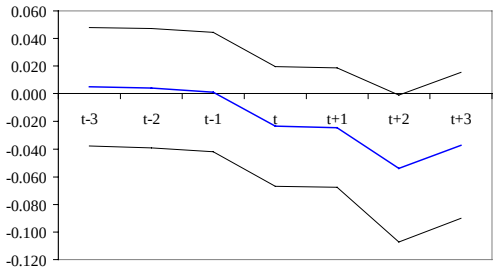


Figure B: continued

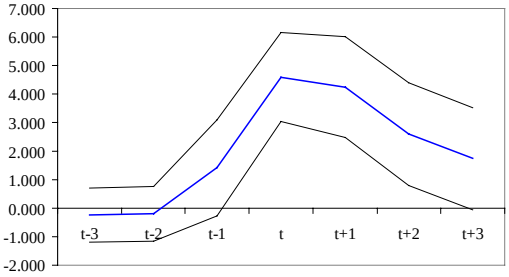
N/T (Levels)



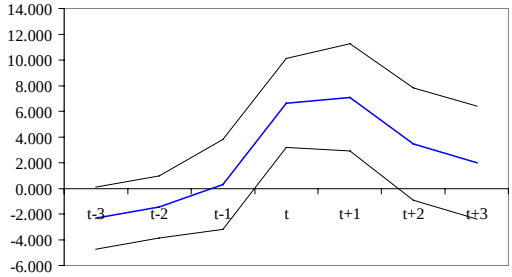
Terms of Trade



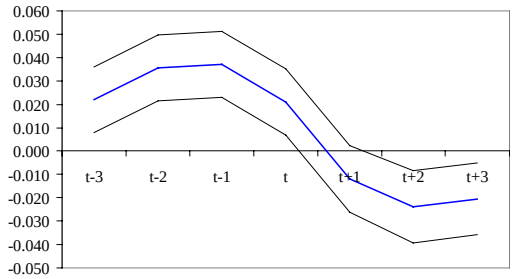
Interest rate spread (levels)



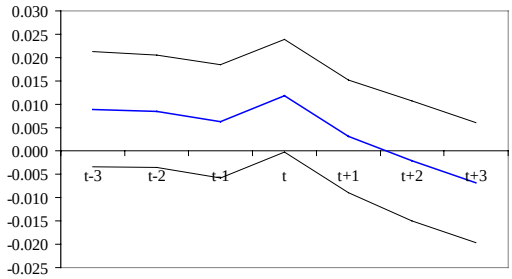
Real interest rates (levels)



Investment/GDP (levels)



Consumption/GDP (levels)



Data sources:

Real exchange rate: IMF, International financial Statistics, CD-ROM. (Lines ..RECZF)

Real GDP growth rates: World Bank Development indicators (Code: NY.GDP.MKTP.KN)

Real credit growth: IMF, International financial Statistics, CD-ROM. Claims on private sector by deposit money banks (Lines 22d..ZF), divided by CPI (Lines 64..ZF)

Deposits: IMF, International financial Statistics, CD-ROM. (Demand deposits, Lines 24..ZF + Time, savings and foreign currency deposits, Lines 25..ZF)

N/T: Services: World Bank Development indicators (Code: NV.SRV.TETC.KN), Manufacturing: World Bank Development indicators (Code: NV.IND.MANF.KN), Construction: OECD Statistical Compendium, Main indicators of industrial activity and individual central banks.

Interest rate spread: World Bank Development indicators (Code: FR.INR.LNDP)

Real interest rate: World Bank Development indicators (Code: FR.INR.RINR)

Gross domestic fixed investment: World Bank Development indicators (Code: NE.GDI.FTOT.KN)

Private Consumption: World Bank Development indicators (Code: NE.CON.PRVT.KN)

Dates of financial liberalization: see Baekert et.al (2001)